

REFERENCE COPY

DO NOT REMOVE
FROM THIS ROOM**MAGAZINE**

COMPUTERS

**Cached and Costly:
9 20-MHz 386SX PCs
Take the SX Chip
To the Limit**

FIRST LOOKS

**PageMaker 4.0
Breaks Barriers
With Better Type,
Text, and Color**

CONNECTIVITY

**Maximize Resources,
Minimize Costs:
9 Printer Sharers for
Under \$150 per PC**

FREE UTILITY

**Save Time, Save
Keystrokes: Jump to
Any Directory or
File with CDX**

APRIL 30, 1991

THE INDEPENDENT GUIDE TO PERSONAL COMPUTING

VOLUME 10 NUMBER 8

The Best Comm Software

PC LAN Labs Tests 17
Programs for DOS and Windows,
From \$30 to \$300

- More-Powerful Scripting
- Faster Data Transfer
- Better User Interfaces
- Wider Protocol Support



It took us
thousands of
steps to make
this spreadsheet
do what we
wanted.

Pro Forma In

1991

184,845

49,292

1,232,300

1,466,437

184,845



Some of the PowerFlex
Family's awards



your workload increases or your software requirements change, and you need a more powerful system. With most PCs, you'd be forced to start shopping for a new computer. But with the ALR PowerFlex, you can just plug in one of ALR's economical PowerFlex 20-MHz 386SX™ or 25-MHz i486™ CPU upgrade modules, and watch it fly through complicated applications such as desktop publishing and presentation graphics.

If you think that equipping everyone in your office with a fast, AT-compatible system is beyond your budget, then you need to look at the 16-MHz, **386SX**-based SX PowerFlex from ALR. This space-saving system gives you all of the features that you need in a desktop system, plus compatibility with the widest range of PC software and a few advanced ALR extras, for a starting price that will make office automation a reality for everyone in your office - **\$1195**.

And if a low price isn't enough to convince you, take a look at this fact. The ALR SX PowerFlex is the only 16-MHz 386SX-based system with ALR's advanced **Just Upgrade the CPU!**™ technology. Unlike most PCs, the ALR SX PowerFlex can actually grow with your business. Suppose that next year

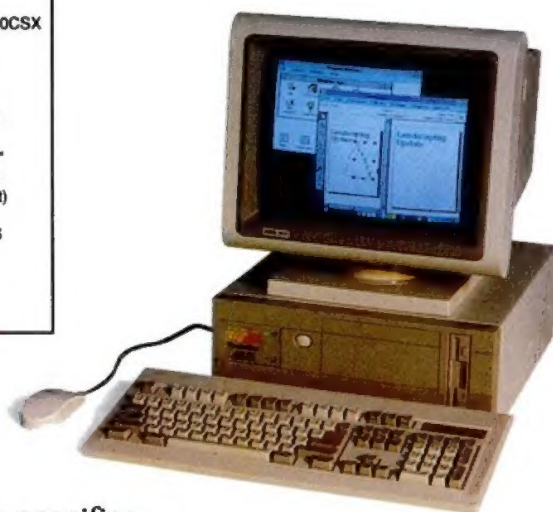
Prices and configurations subject to change without notice; verify competitive pricing with manufacturer. Prices based on U.S. dollars. System shown with optional monitor and optional mouse. ALR is a registered trademark, and Just Upgrade the CPU! is a trademark of Advanced Logic Research, Inc. All other brand and product names are trademarks or registered trademarks of their respective owners. © 1990 by Advanced Logic Research, Inc.

There's A Better Way To Get A PC On Every Desk.

The ALR **SX** PowerFlex
16-MHz 386SX™ Power...

...\$1195

ALR PowerFlex Family			
Model	PowerFlex	SX PowerFlex	PowerFlex 20CSX
CPU	80286	386SX	386SX
CPU Speed	12.5-MHz	16-MHz	20-MHz
Std. RAM	1-MB RAM	1-MB RAM	1-MB RAM
Exp. on Motherboard	5-MB RAM	5-MB RAM	5-MB RAM
Total RAM Expansion	16-MB RAM	16-MB RAM	16-MB RAM
Memory Cache			32-KB
Floppy Drive Std.	1.44-MB 3.5"	1.44-MB 3.5"	1.44-MB 3.5"
Hard Drive Available	40-, 106-MB	40-, 106-MB	40-, 106-MB
Expansion Slots	6- 1 (8-16-bit) 5 (16-bit)	6- 1 (8-16-bit) 5 (16-bit)	6- 1 (8-16-bit) 5 (16-bit)
Upgrades to:	16-MHz 386SX, 20-MHz 386SX 25-MHz i486	20-MHz 386SX 25-MHz i486	25-MHz i486
Starting Price	\$995	\$1195	\$1749



The SX PowerFlex is your ready-made solution for popular office applications such as Lotus® 123™, Microsoft® Word™, WordPerfect®, dBase™, and hundreds of other favorite programs. With its 386SX processor, you can even take full advantage of 386-specific programs such as Desqview 386™. Five industry standard expansion slots, standard serial and parallel ports, and plenty of room for additional hard and floppy drives give you the flexibility you need to customize this system to

your unique specifications. It just doesn't make any sense to limit your options by buying any other 16-MHz 386SX-based PC.

"Just Upgrade the CPU"



Available at these selected resellers:

ALR Power Partner
Resellers

Connecting Point™
COMPUTER CENTERS

ENTRE

TCBC



JWP Information Systems
Computer Systems Group

To find out just how easy and affordable it is to put a PC on every desk in your office, contact your local ALR reseller, or call:

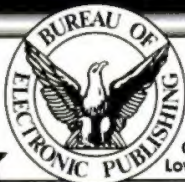
1-800-444-4ALR

ALR®

Advanced Logic Research, Inc.
9401 Jeronimo, Irvine, CA 92718
(714) 581-6770, FAX (714) 581-9240

CIRCLE 165 ON READER SERVICE CARD

CD-ROM



Guaranteed
Lowest Prices!

NEW

Countries of The World

The Ultimate International Reference

Full text of 106 country study books including color maps by Hammond, national anthems (sound), flags & more... Topics include historical setting, society, environment, economy, business statistics, government, politics, & security. \$495

Pioneer CD-ROM 6 Pak

Add to your CD-ROM collection with this special Pioneer bundle of discs

- U.S. History on CD-ROM • Countries of the World
- Sherlock Holmes • Shakespeare
- Birds of America • Software Potpourri

6 of the Bestselling discs all for only \$389
Six Pack & Minicharger (Save over \$1000) \$1489

U.S. History on CD-ROM

Full text of 107 U.S. History books with 1,000 images, tables & maps!
Microsoft Windows 3 compatible \$395

CD-ROM BUNDLES!

Get The New Philips CM-50 Drive & Any 5 Of These Discs!

Only \$597 SAVE OVER \$1200

Microsoft Bookshelf all time best seller
U.S. History on CD-ROM full text of 107 books
Illustrated Encyclopedia 21 volumes, VGA
CIA World Fact Book Non classified info
Golden Immortal multi-media game
Between Heaven & Hell practical/perverse
Sherlock Holmes on Disc 221 Baker St. fans
Shakespeare on Disc "complete works"
Software Potpourri • Bible • Movie Database

CD-ROM Drives (ready to run)

Denon DRD-253 Drive SCSI built in speaker SALE Call
Hitachi Drives- all models, PC and Mac From \$599
Chicon CD-431 CD-ROM Drive \$749
Pioneer Minicharger CD-ROM Drive Lowest Price
Also: CDT, Sony, Todd, NEC, WORM & Erasable drives - Call!

Business

C Library or Ada or Shareware Grab Bag \$89
CIA World Fact Book for international "business" 99
Speed Dial entire U.S. Yellow Pages on one disc 399
Microsoft Bookshelf best selling CD-ROM disc Best Price
Business Lists on Disc desktop marketing 795
PC-Sig Library new edition, version 9 Call
Telephone Directory East or West 995

Libraries and Science

Movie Directory Database/Software Potpourri \$49
Between Heaven & Hell II even stranger Sale \$79
Sherlock Holmes or Shakespeare "complete" Call
Grollier's Encyclopedia 21 volumes, VGA pictures Call
McGraw-Hill Ref. Set 100,000 terms, 7,300 articles 245
Mammals includes pictures & text Call
Oxford Textbook of Medicine general reference 595
Oxford English Dictionary over 250,000 headwords! 889
Compton's Multi-Media Encyclopedia 895

* MORE! Over 300 different titles available *
Money back guarantee Free tech support
CALL - Bureau On-Line CD-ROM Library,
FREE access to 12 different CD-ROM Discs



VISA

MasterCard

FEDERAL EXPRESS

Overnite Delivery

Bureau of

Electronic Publishing, Inc.

Dept. P, 141 New Road, Parsippany, NJ 07054

FAX # 201-808-2676

CALL: **800-828-4766** ORDERS
201-808-2700 INFORMATION

CIRCLE 180 ON READER SERVICE CARD

Inside

This issue's cover story on communications packages reminds us of the increasingly important role connectivity plays in the PC marketplace and of how our editorial approach to connectivity has evolved.

Connectivity first became a focal point at *PC Magazine* in 1985, when we opened PC Magazine LAN Labs in Virginia. The brainchild of editor-in-chief Bill Machrone and work-group systems editor Frank J. Derfler, Jr., PC LAN Labs was established as a place to conduct hands-on testing of LANs and related products. Since then, the connectivity marketplace has grown by leaps and bounds, and the magazine's coverage of it has more than quadrupled.

Six years ago, we published a small volume of connectivity-based articles on an average of one story every two or three issues. Today, we publish up to three articles every issue, plus Derfler's regular column. To handle the increased volume of connectivity products, we've moved the LAN Labs to a larger facility in Florida. And, to keep up with the increased workload, we've expanded our connectivity staff.

Last December, we augmented Derfler's LAN Labs staff with a New York-based team of seven people, who work on nothing but connectivity stories. In charge of this intrepid team is Jennifer Zaino, recently promoted to



associate editor. A *PC Magazine* veteran of five years, Zaino spent two years as a staff editor, working on more connectivity stories than anyone besides Derfler and LAN Labs project leader Randol Tigrett.

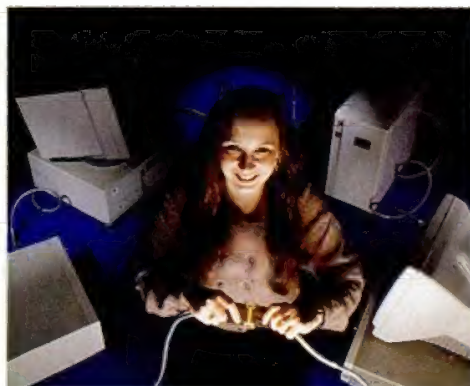
Over the years, Zaino has watched our definition of connectivity broaden: "Today, we look at the connectivity aspect of all PC products. There

isn't a facet of computing that isn't touched—or about to be touched—by connectivity." So today's connectivity products defy traditional categories; they can be hardware, software, or a combination.

As a case in point, take the two connectivity stories in this issue: communications packages and printer-sharing devices. Although you'd be hard pressed to find two more dissimilar product categories, to Zaino, it's a natural fit.

"Communications is connecting. Just as you transfer files across the network, you can transfer files across the phone lines. And printer-sharing devices are just right for small workgroups that can't afford a printer for every PC and don't need a LAN. It's all part of making the connection," she explains. As Zaino says, the slogan that is emblazoned on our PC LAN Labs T-shirts, is more true now than ever before: "If you're not connected, you're not computing."

—Mary Kathleen Flynn



At the center of our New York-based connectivity team is associate editor Jennifer Zaino.

PC Magazine: The Independent Guide to IBM-Standard Personal Computing, ISSN #0898-8507, is published biweekly except in July and August for \$44.97 for one year. Ziff-Davis Publishing Co., a division of Ziff Communications Co., One Park Ave., New York, NY 10016. Second-class postage paid at New York, NY 10016 and at additional mailing offices. POSTMASTER: Address changes to PC Magazine, P.O. Box 54093, Boulder, CO 80321-4093.

"With on-site service included, these Zenith Data Systems PCs give me total confidence for the future."



ZENITH DATA SYSTEMS INNOVATES AGAIN™

Now the *Total Performance • TotalCare Bonus* gives you on-site *TotalCare™* Service with eligible Zenith Data Systems PCs!

Today, you need confidence that the PCs you choose can carry your business into the future and stay up and running when you need them. That's why some of our most advanced desktop PCs are now available with a very special feature—one full year of on-site TotalCare Service* at no additional charge.

TotalCare protects your PC investment. Just one toll-free call to our 24-hour National Response Center puts you in touch with a North American network of over 2000 employees. And if you need on-site service, an experienced Customer Service Engineer will travel to your business to make things right—the next day in most cases! You can even purchase TotalCare contracts to cover other manufacturers' products.

This special offer includes hard drive models of the Z-386SX/20™ PC, the Z-386/20™ and Z-386/25™ Workstations, the Z-386/33E™ File Server and the Z-486/25E™ Personal Workstation. All come with MS-DOS® 4.0 and Microsoft® Windows™ version 3.0 pre-installed, plus a Microsoft Mouse.



Add our award-winning Flat Technology Monitor, or our advanced 16" (15" v) high-resolution monitor for our Z-486/25E, and you've got *The Seamless Solution*—our formula for total performance in today's graphical computing environment.

But you'll have to hurry to take advantage of the *Total Performance • TotalCare Bonus*—offer ends May 24, 1991.

For more information and the name of your Zenith Data Systems Representative, call 1-800-523-9393.

Z-386SX/20 PC



ZENITH
data systems



Groupe Bull

*See TotalCare Service agreement and call your Zenith Data Systems representative for details. One year on-site service also good on monitor when purchased with eligible PC. A predetermined cash amount may be substituted for one year on-site service. Graphics simulate Microsoft Windows version 3.0, a product and trademark of Microsoft Corporation. Intel386SX, 386 and i486 are trademarks of Intel Corporation. MS-DOS is a registered trademark of Microsoft Corporation. TotalCare is a trademark of Bull HN Information Systems, Inc. Copyright © 1991, Zenith Data Systems Corporation.

CIRCLE 732 ON READER SERVICE CARD

UP FRONT

4 INSIDE

15 LETTERS

27 ADVISOR

Gus Venditto/ Using the same version of OS/2 when you switch from a desktop to a portable; printing sheet music; what you need to know about running *Microsoft Windows 3.0* on a network.

33 FIRST LOOKS

- Better than ever, **PageMaker 4.0** pushes the DTP envelope.
- **Zeos Notebook 386** and **Dataworld NB/320SX**: Two for the price-conscious.
- **Borland C++ 2.0** gets an A++ for *Windows* tools.
- **AutoShade 2.0** adds photorealism.

55 NEW AND IMPROVED

Cristina Córdova and Nate Zelnick

65 READ ONLY

Matthew J. Ross

67 PIPELINE

Gus Venditto

COLUMNISTS

75 BILL MACHRONE

Pen-Based Computing: Get the Point?

81 JOHN C. DVORAK

Data Has No Worth Inside Track

87 JIM SEYMOUR

How Microsoft Blew It with Word 5.5

95 WILLIAM F. ZACHMANN

How Much PC Power Is Enough?

COVER STORY

101 COMMUNICATIONS

Asynchronous Communications Software: Improving Information Access

Mike Byrd/ The latest generation of asynchronous communications software speeds up information access through ZModem protocol support. Better interfaces make these programs easier to use, and their sophisticated script languages make them more powerful. *Windows* and DOS users can pay as little as \$30 or as much as \$300 for one of these 17 packages.

111 *BLAST PC*

112 *COM-AND*

124 *Crosstalk Communicator*

128 *Crosstalk for Windows*

140 *Crosstalk Mk. 4*

145 *DynaComm Asynchronous Edition*

146 *HyperAccess/5*

156 *Mirror III*

160 *MTEZ*

166 *PereLine*

169 *ProComm Plus*

170 *Professional YAM*

175 *QModem*

177 *Smartcom Exec*

179 *Telix*

188 *Unicom*

194 *WinComm*

106 **Editors' Choice**

114 **Summary of Features**

138 **Tailor-Made**

Communications

156 **Performance Tests**

165 **OBJECTTEL:**

Communicating the French Way

176 **Communications for Databases**

178 **The 16550A UART: Breaking Old**

Bottlenecks

194 **Communications Without ZModem: Old**

Standards and a New

Favorite

FEATURES

207 COMPUTERS

To the Limit: Caching the 386SX/20

Bill O'Brien/ PC Magazine Labs tests nine small-footprint cached 386SX/20s that are designed to compete with 386DX/25s.

218 *AGI 3000B*

218 *AST Premium II 386SX/20 Model 113V*

226 *CompuAdd 320sc*

227 *Computer Market Place Ultra 386SX-20*

231 *Diamond Technologies DT 386SX-20*

232 *Elitech 2200*

233 *Leading Edge D3/SX20c*

234 *Micro Express ME 386-SX/20/Caching*

244 *Zenith Z-386 SX/20*

217 **Editors' Choice**

220 **Summary of Features**

234 **Performance Tests**

253 HARDWARE

Training Tools for Laser Users

Bruce Brown/ Now that the price of a personal laser printer is hovering around \$1,000, lasers are landing on more and more desktops. Today's challenge is to train the new generation of users. *PC Magazine* reviews 17 books and 4 videotapes aimed at novices, experienced laser users, and programmers. Also included are tips from the reviewed books and from the experts at *PC Magazine*.

255 *Hardware Handbooks*

256 *Printer Publications*

258 *Multivendor Resources*

259 *For LaserJets Only*

264 *When You Don't Own a LaserJet*

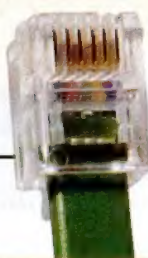
265 *Power Printing Guides*

268 *Programmers' Codices*

269 *Training Tapes*

254 **Editors' Choice**



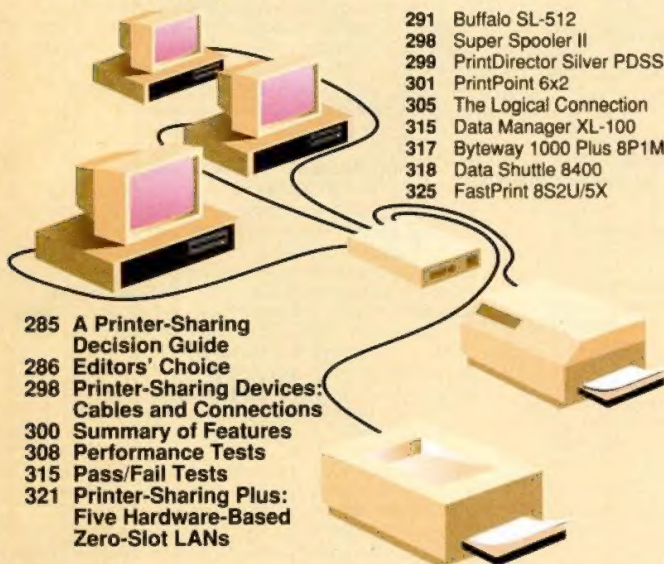


FEATURES

283 CONNECTIVITY

Building Workgroup Solutions: Buffered Printer-Sharing Devices
M. David Stone/ These nine buffered printer-sharing devices offer a rich mix of performance, ease of use, and functionality—at low cost. Best of all, these intelligent devices eliminate the inconvenience of a mechanical “dumb” switch.

- 291 Buffalo SL-512
- 298 Super Spooler II
- 299 PrintDirector Silver PDSP
- 301 PrintPoint 6x2
- 305 The Logical Connection
- 315 Data Manager XL-100
- 317 ByteWay 1000 Plus 8P1MB
- 318 Data Shuttle 8400
- 325 FastPrint 8S2U/5X



- 285 A Printer-Sharing Decision Guide
- 286 Editors' Choice
- 298 Printer-Sharing Devices: Cables and Connections
- 300 Summary of Features
- 308 Performance Tests
- 315 Pass/Fail Tests
- 321 Printer-Sharing Plus: Five Hardware-Based Zero-Slot LANs

331 SOFTWARE

Brainstorming Software: A Free Flow of Ideas
Greg Pastrick/ Coming up with bright ideas on demand is never easy. These three packages won't think for you, but they will inspire creativity and prod your brain.

- 333 Brainstormer
- 334 IdeaFisher
- 338 The Idea Generator Plus
- 332 Editors' Choice
- 332 Features Table
- 337 Breaking Through Writer's Block

AFTER WORDS

477 AFTER HOURS

■ Two new adventure games from Lucasfilm and Sierra On-line whisk you away to alternative realities.

■ *Rise of the Dragon* maroons you inside a nightmare vision of 21st-century Los Angeles.

■ *Play It by Ear* patiently teaches you musical basics.

482 ABORT, RETRY, FAIL?

Bill Howard



- 373 PC MagNet News
- 426 Direct Marketing Connection
- 449 Marketplace
- 479 Index to Advertisers
- 472 Editorial Product Index
- 433 Reader Service Card
- 473 Coming Up
- 474 Advertisers' Product Index
- 448 Premier

PRODUCTIVITY

343 LAB NOTES

Luisa Simone/ A Guide to PostScript for Non-PostScript Programmers

361 UTILITIES

Michael Holmes and Bob Flanders/ Finding and Changing to the Directory You Want with CDX.COM

375 ENVIRONMENTS

Charles Petzold/ Color Complexities and Craziness in Windows 3.0

387 POWER PROGRAMMING

Ray Duncan/ Exploring Dynamic Data Exchange in Windows 3.0 with WordBASIC

393 WINDOWS

William S. Hall/ Keeping track of graphics files; how applications size and place windows; group limits in real mode; using Windows 3.0 with the Intel InBoard 386/PC; displaying more lines on your VGA screen.

397 DATABASES

Sal Ricciardi/ Create dBASE .BIN files using Turbo C; Clipper's low-level I/O commands make it a snap to generate batch files.

405 SPREADSHEETS

Craig Stinson/ A short Lotus 1-2-3 formula generates a list of month-ending dates; some tips on using text values in lookup functions.

407 THE WORKING WORD

Costa Rodis/ Use simple keystroke combinations to add French accented characters to your documents; the best way to import Quattro Pro graphs into Microsoft Word.

409 USER-TO-USER

Neil J. Rubenking/ Protect your hard disk from unwanted modifications by changing some of DOS's internal commands.

413 LANGUAGES

Trudy Neuhaus/ Use C to play a tune on your PC; create unique filenames in Turbo Pascal using the current date and time.

419 TUTOR

Jeff Prossie/ Speed up your 386 with shadow RAM; IDE drives offer high performance at modest prices; keep REMOVE.COM from asking questions; DOS's KEYB command.

423 CONNECTIVITY

Frank J. Derfler, Jr./ An excellent NetBIOS reference; laptop tips for network installers on the go; maintaining uninterrupted power; linking LAN operating systems.



Editor-in-Chief and Publishing Director Bill Machrone

Executive Editors Bill Howard, Gus Venditto

Workgroup Systems Editor Frank J. Derflier, Jr.

Senior Editors Trudy Neuhaus (Productivity), Robin Raskin (First Looks)

Senior Editor, West Coast Christopher Barr

Managing Editors Diane D'Angelo, Paul B. Ross

Manager, Copy Edit Karen A. Carter **Associate Editors** Julie Cohen (PCs), Mary Kathleen Flynn (Hardware), Jonathan Matzkin (After Hours), Rock Miller (Graphics), Sharon Terdeman (Productivity), Don Willmot (Software), Jennifer Zaino (Connectivity) **Technical Editor** Neil J. Rubenking **Copy Chief** Glen Becker **Assistant Production Editors** Jeanne Albrecht, Alan Cohen, Wendy Murch **Staff Editors** Michael Cohn, Gayle C. Ehrenman, Carol Levin, Oliver Rist, Matthew J. Ross, Ann Sherman, Craig L. Stark, Tom Unger **Assistant Editors** Karen Best, Robin B. Bornstein, Cristina Córdova, Gavin Edwards, Stephanie Izarek, Ellyn McCasland, Michael W. Muchmore, Ann Ovodow, Kim Schueler, Shari L. Serio **Editorial Assistants** Eric Berlin, William P. Flanagan, Angela Gunn, Catherine Kunkemueller, Emerson A. Torgan, Susan Paige York, Nate Zelnick **Proofreaders** Daniel A. Begun, Chris Regan **General Business Manager** Tom McGrade **Associate Business Manager** Allen Wollman **Network Manager** Joe Rizzo **Librarian** Thomas W. Giebel **Assistant to the Publishing Director** David Baker **Assistant to the Executive Editors** Christina M. Evelyn **Administrative Assistant** Christina Okang **Database Assistant** Dolores Williams

Contributing Editors Frank Bican, Douglas Boling, Bruce Brown, Ray Duncan, John C. Dvorak, Mitt Jones, Stephen Manes, Michael J. Mefford, Edward Mendelson, Bill O'Brien, Charles Petzold, Alfred Poor, Jeff Prosser, Winn L. Rosch, Jim Seymour, Richard Hale Shaw, Barry Simon, Luisa Simone, Craig Stinson, M. David Stone, Ethan Winer, William F. Zachmann

Support Associate, PC MagNet Christopher T. Parker **Sysops, PC MagNet** Rick Ayre, Jesse Liberty

Director, Design and Electronic Publishing Gerard Kunkel

Art Director Jerry Tortorella **Associate Art Directors** Charles Conover, Renata Gomes, Patricia Isaza, Mariano Nicieza, Robert C. Smith **Assistant Art Director** Michael L. Graham **Associate Graphics Director** Gary W. Kaplow **Electronic Graphic Artists** Simone Blank, David Foster, Robin L. Malik **Assistant to the Director of Design** Frieda T. Smallwood

Director, PC Labs C. James Galley III

Technical Director, PC Labs Robert W. Kane **Project Leaders** Richard Brady (Connectivity), Gabrielle Gagnon (Software), Lori Grunin (Graphics), Wendy Dugas Pérez (PCs), Randol Tigrett (PC LAN Labs), Michael J. Zulich (Hardware) **Sr. Programmer** Stuart R. Greenberg **System Support Manager** Charles Rodriguez **Sr. Tech. Analyst** Stephen W. Plain Jr. **Tech. Analyst** Mario Baldasserini **Support Technician** Margaret A. Piemonte **Lab Assistants** Laura Cox, Bradley G. Epranian, Carolyn Falconer **Operations Manager** John R. Delaney **Inventory Control Coordinators** Peter Bastide, Rob Graydon, John Jones **Secretary** Ann Jo Sanchez

Publisher Ronni Sonnenberg

Director, Marketing Ellen Atkinson **Events** Stacy O'Connell **Market Information** Michael Van Engen **Sales Development** Jeff Stanley **Subscriptions** Charles Mast **Single Copy Sales** James E. Gerth

Assistant Production Director John Ansaldi **Senior Advertising Production Manager** Vicki Egan Root **Advertising Production Manager** Lori Iaccino **Advertising Production Assistants** Pam Berkowitz, Oris D'Amil **Editorial Production Coordinators** Kevin S. Fagan, Jo-Ann Hirschel **Production Systems Supervisor** Linda Harms **Production Systems Assistant** Lillian Gaffney

Advertising Office: One Park Ave., New York, NY 10016; 800 33 MAG AD, 212-503-5100
Subscription Problems: 800-289-0429, 303-447-9330 (outside the U.S.)

ZIFF-DAVIS PUBLISHING COMPANY

President Eric Hippeau
Executive Vice President J. Scott Briggs
Senior Vice President, Marketing Paul H. Chook
Group Vice President, Mac Publications J. Samuel Huey
Group Vice President, Direct Publications Jim Stafford
Vice President, Operations Baird Davis
Vice President, Business Manager T.L. Thompson
Vice President, Controller Howard D. Skolnik
Vice President, Circulation Bert Lacy
Vice President, Circulation Services James Ramaley
Vice President, Creative Services Herbert Stern

Vice President, Marketing Services Ann Pollak Adelman
Vice President, Production Roger Herrmann
Vice President, Research Marian O. White
Vice President, Europe Frank Kelcz
Vice President, Asia-Pacific Alan Power
Vice Presidents Bill Machrone, Claude P. Sheer, Ronni Sonnenberg
Director, Classified Sales Paul Stafford
Director of Planning Gary A. Gustafson
Production Director Walter J. Terlecki
Licensing Director Jean Lamensdorf

ZIFF COMMUNICATIONS COMPANY

Chairman William B. Ziff, Jr.
Vice Chairman Philip B. Korsant
President Kenneth H. Koppel
Executive Vice President Philip Sine
Senior Vice President Hugh Tietjen
Vice President, General Counsel, and Secretary J. Malcolm Morris

Vice President, Controller, and Treasurer Patrick J. Burke, Jr.
Vice President, Human Resources Rayna Brown
Vice President, Chief Information Officer Thor Olson
Vice President, Electronic Editorial Director Michael Kolowich
Vice Presidents Seth R. Alpert, Steven C. Feinman, William L. Phillips

Editorial and Business Office: One Park Ave., New York, NY 10016. Editorial: 212-503-5255; Advertising: 800 33 MAG AD, 212-503-5100. *PC Magazine* is an independent journal, not affiliated in any way with International Business Machines Corp. IBM is a registered trademark of International Business Machines Corp. Entire contents copyright ©1991 Ziff-Davis Publishing Co., a division of Ziff Communications Co. All rights reserved; reproduction in whole or in part without permission is prohibited. The following are registered trademarks of Ziff Communications Co.: PC, *PC Magazine*, PC Labs, PC MagNet, PC Magazine Award for Technical Excellence, PC Magazine Editors' Choice Award. The following are trademarks of Ziff Communications Co.: Abort, Retry, Fail?; Connectivity; Databases; Direct Marketing Connection; First Looks; New and Improved; Advisor; Lab Notes; PC Marketplace; Pipeline; Tutor; The PC Utilities; Power Programming; Power User; Read Only; Spreadsheets; User-to-User; The Working Word.

HOW TO CONTACT THE EDITORS

The editors of *PC Magazine* want to hear from you. Please send your questions, complaints, compliments, and submissions to *PC Magazine*, One Park Ave., New York, NY 10016. Send electronic mail to MCI Mailbox 157-9301 (*PC Magazine*) or PC MagNet (see below). *PC Magazine's* general number is 212-503-5255. The West Coast Operations number is 415-378-5500. For other Ziff-Davis publications, call 212-503-3500.

We are unable to look up stories from past issues, recommend products, or diagnose problems with your PC by phone. If you bought a product advertised in *PC Magazine*, are dissatisfied, and can't resolve the problem, write (do not call) Kim Alexander, Advertising Department, at One Park Ave. Include copies of correspondence.

PC Magazine is under no obligation to review unsolicited products. All submissions accepted for publication become the property of *PC Magazine*. We will pay \$50 for Productivity user tips and Abort, Retry, Fail? submissions. For submissions to Abort, Retry, Fail?, if you send artwork for possible reproduction, mark the funny part on a photocopy, not the original.



PC MAGNET: PC MAGAZINE'S ON-LINE SERVICE

PC Magazine operates PC MagNet, an on-line service where readers can find the utilities published in each issue, download an index of reviews, share opinions with the editors, and access *Computer Library*. To join, set your communications software for either 300 or 1,200 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest you, dial 800-346-3247. (In Canada, call 800-635-6225, voice only.) When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you.

After you have found the phone number, hang up and dial using the number you just found. When you connect with PC MagNet, press Ctrl-C. At the HOST NAME prompt, enter CIS. At the USER ID prompt, enter 177000,5000. Enter PC*MAGNET at the PASSWORD prompt and Z10D9000 at the ENTER AGREEMENT NUMBER prompt. CompuServe members can join by entering GO PCMAG at any CompuServe prompt. To upload a letter, type GO PCM:FORUMS. For Customer Service, call 800-848-8990. PC MagNet costs \$12.80 per hour via MasterCard, VISA, or American Express.

PERMISSIONS, REPRINTS

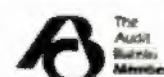
Material in this publication may not be reproduced in any form without permission. If you want to quote from an article or use *PC Magazine's* logo in conjunction with an Editors' Choice designation, write Chantal Lavelanet; for information on reprints in quantities of 500 or more, write Claudia Crichlow.

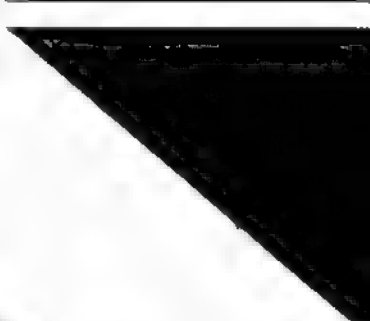
SUBSCRIPTION QUESTIONS

If you want to subscribe to *PC Magazine*, if you have a question about your subscription, or if you're moving, call or write: *PC Magazine*, P.O. Box 54093, Boulder, CO 80322; 800-289-0429, 303-447-9330 (outside the U.S.). A 1-year subscription (22 issues) costs \$44.97. Canada and foreign: add \$32.00 per year (R-123669673). New subscriptions and address changes take 6 to 8 weeks to process. For back issues (subject to availability) write Back Issues Department, Ziff-Davis Publishing Company, P.O. Box 53131, Boulder, CO 80322-3131. Send \$8 per issue (check or money order); \$9 outside the U.S.

PC MAGAZINE REVIEWS

Except where noted: All *PC Magazine* reviews are of currently available products. Comparative reviews are arranged alphabetically by product name for software, by company name for hardware. Software is free from copy protection. On benchmark test charts, shorter bars indicate faster products (less time to complete a task). Benchmark and performance tests are run on Compaq 386/25s.





**What's the
difference
between
an Austin
and a Dell?**



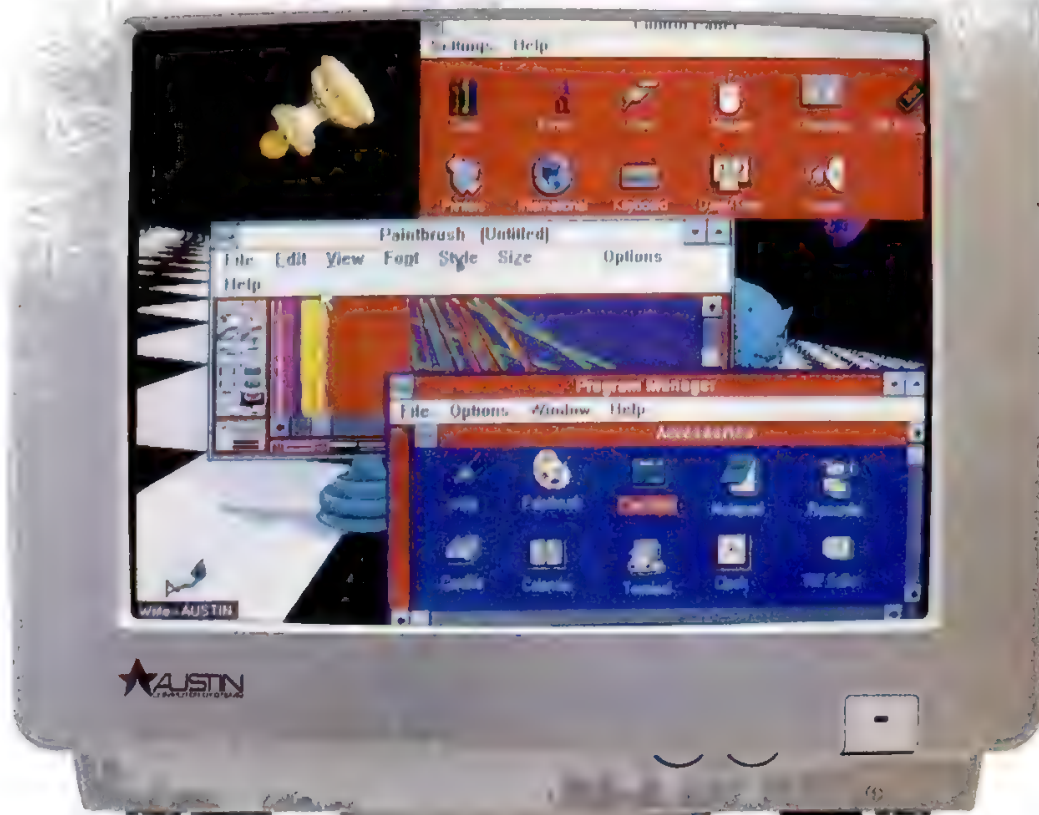
Editors
Choice
386/SX16
1990



Editors
Choice
286/12.5
1989



Editors
Choice
386/SX20
U.K. 1991



386/SX-16

40 Mb Hard Drive
2Mb RAM
Monochrome Monitor
1 Floppy Drive
Microsoft Package
GE On-Site Service

\$1490

Upgrade to VGA Color
System shown \$1890.



The Price!

BEST PC VALUE

Austin Computer Systems gives you the best value in a PC purchase. PC Magazine Editor's Choice Awards. American-made quality. GE on-site next day service. Top quality components. Toll-free technical support. A 30-day money-back guarantee. 100% financing. Leasing options. Novell Certified NetWare Engineers. Specialized VAR, Government, Education, International and Networking departments. And you get it all for less money!

We believe in giving you more than just a top-quality computer. We also believe in value, and in giving you as much for your dollar as you deserve.

Austin value starts with the Austin WinStations! Your already powerful Austin system comes with the Microsoft Windows Package loaded and ready to go! Just unpack it and plug it in... Microsoft Windows 3.0, DOS 4.01 and a Microsoft mouse are yours—absolutely free!

GE ON-SITE NEXT DAY SERVICE

Every Austin desktop comes with 1 year of GE on-site service. That means we'll have a Service Engineer to your computer site usually within 24 hours! We even offer extended GE contracts for up to five years.



GE Computer Service

AWARD-WINNING REVIEWS

Don't just take our word for it. Listen to what our customers and the industry experts say:

"The Austin has it all..." PC Magazine 386/SX Editor's Choice Award, 1/30/90 Issue

"Austin Computer Systems has a winning combination... How can you lose?" PC Magazine 286/12.5

Editor's Choice Award, 1/31/89 Issue

"Austin Computer Systems is on a roll..."

Fredric Burke, PC Magazine

Computer Consultant, 9/25/90 Issue

"Austin's 386/25 WinStation is a system loaded with value..."

PC Magazine Editor's Choice Review, 1/29/91 Issue

"Do yourself a favor and check out the Austin 386/SX."

Computer Shopper, April 1990 Issue

"I have found the phone support to be excellent... I recommend them to everyone and would not hesitate to buy another." Douglas Figgs, New

York Engineer, PC Magazine Service and Reliability Review, 9/25/90



QUALITY ASSURANCE

We take pride in knowing that the system you receive operates to your highest expectations. Strategic alliances with top companies insure that you're getting the best components available. Plus, your system will get standard burn-in and extensive quality assurance tests before it is shipped to you.

LEASING

Austin offers companies and individuals the opportunity to lease systems. Choose a 24, 36, or 48-month plan and pay low monthly installments while you use the system!

30-DAY SATISFACTION GUARANTEE

We don't compromise on quality. If your computer is not perfect the entire first year, we'll fix or replace any part immediately and without charge. You can even return your computer within the first 30 days for a full refund on the hardware price, no questions asked.

TOLL-FREE TECHNICAL HOTLINE

If you ever have a technical question, or just need information, you can call our highly trained specialists, six days a week about your Austin computer.

VAR

Approved Value-Added Resellers enjoy special volume purchase discounts while keeping inventory low and profits high.

GOVERNMENT/GSA

We also work for the government by providing federal, state and municipal offices with American-made quality performance machines available at quantity discounts.

EDUCATION

Students, faculty and administration from educational institutions can contact our Education Department for special purchase offers on our complete line.

INTERNATIONAL

Continuous recognition of our award-winning systems from the experts has made Austin one of the most sought after computer systems overseas. Our International Department continues to provide businesses the value and quality that have become standard features of the Austin Computer Line.

NETWORKING

Businesses can enjoy increased productivity by implementing a Local Area Network to share software and exchange information. Austin Computers is a Novell Gold Authorized Reseller, and our Certified NetWare Engineers can get your business connected today!



100% FINANCING

We offer 100% financing with our Austin Computer Systems Credit Card. Just call and we'll take your application over the phone in minutes! We welcome purchase orders and company checks from our corporate accounts. We'll begin processing approval applications immediately, and will let you know usually the very same day.



1-800-752-1577

All Time Zone—Mon-Fri 7am-7pm—Sat 10am-5pm

VAR 1-800-338-1569

GSA 1-800-833-4GSA

FAX (512) 454-1357

OVERSEAS (512) 339-3500

CANADA 1-800-338-1565

NETWORKING 1-800-874-7182



That's a Big



\$1090

AUSTIN 286/16 STANDARD CONFIGURATION

Microprocessor: 80286 running at 16MHz.
Special Features: GE on-site service.
Storage: 40Mb IDE hard drive. 1.44Mb or 1.2Mb floppy disk drive.
Memory: 1Mb RAM
Expansion: 7 expansion slots (6 16-bit and 1 8-bit).
I/O Ports: 1 parallel and 2 serial ports.
Video: TTL monochrome monitor with video adapter.
Keyboard: Enhanced 101 keyboard with tactile/click touch.
Compatibility: DOS and OS/2.

\$1890

AUSTIN 386/SX16 WINSTATION STANDARD CONFIGURATION

Microprocessor: Intel 80386SX running at 16MHz.
Special Features: Pre-loaded with Microsoft Windows 3.0 and MS-DOS 4.01. Microsoft mouse. GE on-site service.
Storage: 40Mb IDE hard drive. 1.44Mb or 1.2Mb floppy disk drive.
Memory: 2Mb RAM
Expansion: 7 expansion slots (6 16-bit and 1 8-bit).
I/O Ports: 1 parallel and 2 serial ports.
Video: 14" VGA color monitor with 16-bit VGA color video adapter.
Keyboard: Enhanced 101 keyboard with tactile/click touch.
Compatibility: DOS, OS/2 and Unix.

\$1990

AUSTIN 386/SX20 WINSTATION STANDARD CONFIGURATION

Microprocessor: Intel 80386SX running at 20MHz.
Special Features: Pre-loaded with Microsoft Windows 3.0 and MS-DOS 4.01. Microsoft mouse. GE on-site service.
Storage: 40Mb IDE hard drive. 1.44Mb or 1.2Mb floppy disk drive.
Memory: 2Mb RAM
Expansion: 7 expansion slots (6 16-bit and 1 8-bit).
I/O Ports: 1 parallel and 2 serial ports.
Video: 14" VGA color monitor. 16-bit VGA color video adapter.
Keyboard: Enhanced 101 keyboard with tactile/click touch.
Compatibility: DOS, OS/2 and Unix.

\$2590

AUSTIN 386/25 WINSTATION STANDARD CONFIGURATION

Microprocessor: Intel 80386 running at 25MHz.
Special Features: Pre-loaded with Microsoft Windows 3.0 and MS-DOS 4.01. Microsoft mouse. GE on-site service. Small footprint chassis.
Storage: 90Mb IDE hard drive. 1.44Mb or 1.2Mb floppy disk drive.
Memory: 2Mb RAM
Expansion: 7 expansion slots (6 16-bit and 1 8-bit).
I/O Ports: 1 parallel and 2 serial ports.
Video: 14" VGA color monitor. 16-bit VGA color video adapter.
Keyboard: Enhanced 101 keyboard with tactile/click touch.
Compatibility: DOS, OS/2 and Unix.

AUSTIN 286/16 1MB RAM AND 1 FLOPPY DRIVE STARTING AT \$1090 OR \$33 PER MO.				
CHOOSE MONITOR BELOW				
CHOOSE HARD DRIVE BELOW	TTL MONO CHROME	VGA MONO CHROME	VGA COLOR 640 X 480	
40MB IDE	\$1090	\$1255	\$1470	
90MB IDE	\$1310	\$1435	\$1650	
125MB IDE	\$1440	\$1565	\$1780	
200MB IDE	\$1620	\$1945	\$2160	

OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.

AUSTIN 386/SX16 WINSTATION 2MB RAM AND 1 FLOPPY DRIVE STARTING AT \$1890 OR \$45 PER MO.				
CHOOSE MONITOR BELOW				
CHOOSE HARD DRIVE BELOW	TTL MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
40MB IDE	\$1490	\$1890	\$2035	
90MB IDE	\$1755	\$2095	\$2215	
125MB IDE	\$1865	\$2225	\$2345	
200MB IDE	\$2295	\$2605	\$2725	

OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.

AUSTIN 386/SX20 WINSTATION 2MB RAM AND 1 FLOPPY DRIVE STARTING AT \$1845 OR \$56 PER MO.				
CHOOSE MONITOR BELOW				
CHOOSE HARD DRIVE BELOW	VGA MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
40MB IDE	\$1845	\$1980	\$2180	
90MB IDE	\$2025	\$2240	\$2380	
125MB IDE	\$2155	\$2370	\$2490	
200MB IDE	\$2535	\$2750	\$2870	

OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.

AUSTIN 386/25 WINSTATION 2MB RAM AND 1 FLOPPY DRIVE STARTING AT \$2220 OR \$47 PER MO.				
CHOOSE MONITOR BELOW				
CHOOSE HARD DRIVE BELOW	VGA MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
40MB IDE	\$2220	\$2435	\$2555	
90MB IDE	\$2400	\$2680	\$2735	
125MB IDE	\$2530	\$2745	\$2865	
200MB IDE	\$2910	\$3125	\$3245	

OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.

Difference!



\$3290

AUSTIN 386/33 WINSTATION STANDARD CONFIGURATION

Microprocessor: Intel 80386 running at 33MHz.
Special Features: 128K system cache. Pre-loaded with Microsoft Windows 3.0 and MS-DOS 4.01. Microsoft mouse. GE on-site service. Small footprint chassis.
Storage: 125Mb IDE hard drive with 32K cache. 1.44Mb or 1.2Mb floppy disk drive.
Memory: 4Mb RAM
Expansion: 7 expansion slots (6 16-bit and 1 8-bit).
I/O Ports: 1 parallel and 2 serial ports.
Video: 14" VGA color monitor. 16-bit VGA color video adapter.
Keyboard: Enhanced 101 keyboard with tactile/click touch.
Compatibility: DOS, OS/2 and Unix.



\$3990

AUSTIN 486/25 WINSTATION STANDARD CONFIGURATION

Microprocessor: Intel 80486 running at 25MHz.
Special Features: Internal 8K cache floating point unit. Pre-loaded with Microsoft Windows 3.0 and MS-DOS 4.01. Microsoft mouse. GE on-site service.
Storage: 125Mb IDE hard drive with 32K cache. 1.44Mb or 1.2Mb floppy disk drive.
Memory: 4Mb RAM (expands to 64Mb on system board).
Expansion: 8 ISA expansion slots.
I/O Ports: 1 parallel and 2 serial ports.
Video: 14" VGA color monitor. 16-bit VGA color video adapter.
Keyboard: Enhanced 101 keyboard with tactile/click touch.
Compatibility: Novell, DOS, OS/2 and Unix.



\$7990

AUSTIN 486/33 WINSTATION STANDARD CONFIGURATION

Microprocessor: Intel 80486 running at 33MHz.
Special Features: EISA bus architecture. Internal 8K cache and floating point unit. Optional 64K or 256K external cache. Landmark v1.14 rating-167.8 MHz. Power meter rated @ 14.93 MIPS. Shadow RAM. EMS LIMM 4.0 support. Microsoft package. GE on-site service. Vertical chassis.
Storage: 1.2Gb SCSI hard drive. 1.44 Mb or 1.2Mb floppy disk drive.
Memory: 8Mb RAM (expands to 64Mb on system board).
Expansion: 8 32-bit EISA/ISA compatible slots. 8 slots available for bus masters.
I/O Ports: 2 parallel and 2 serial ports.
Video: 14" VGA monochrome monitor. 16-bit VGA video adapter.
Keyboard: Enhanced 101 keyboard with tactile/click touch.
Compatibility: Novell, DOS, OS/2 and Unix.



\$2295

AUSTIN 386/SX16 NOTEBOOK STANDARD CONFIGURATION

Microprocessor: 80386SX running at 16MHz.
Special Features: Weight under 8 lbs. with battery. Notepad size. Dual removable battery packs for up to 4 hour battery life. Visual/Audio low battery warning indicator. Leather carrying case. Battery and recharger included.
Storage: 20Mb hard drive. 1.44Mb floppy disk drive.
Memory: 1Mb RAM (expands to 8Mb on system board).
Expansion: 2 expansion pack slots. External VGA monitor port. External keyboard port. Printer port. 2 serial ports (1 for modem pack).
Video: Brilliant 10" VGA display with 640 x 480 resolution and 32-gray scale.
Keyboard: Full size embedded numeric pad with 12 function keys.
Compatibility: DOS, OS/2 and Unix.

AUSTIN 386/33 WINSTATION 4MB RAM AND 1 FLOPPY DRIVE STARTING AT \$2820 OR \$85 PER MO.				
CHOOSE MONITOR BELOW				
CHOOSE HARD DRIVE BELOW	VGA MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
40MB IDE	\$2820	\$3035	\$3155	
90MB IDE	\$3000	\$3215	\$3335	
125MB IDE	\$3130	\$3290	\$3435	
200MB IDE	\$3510	\$3725	\$3845	

OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.

AUSTIN 486/25 WINSTATION 4MB RAM AND 1 FLOPPY DRIVE STARTING AT \$3690 OR \$117 PER MO.				
CHOOSE MONITOR BELOW				
CHOOSE HARD DRIVE BELOW	VGA MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
125MB IDE	\$3690	\$3900	\$4185	
200MB IDE	\$4290	\$4475	\$4595	
330MB SCSI	\$4730	\$4945	\$5065	
1.2GB SCSI	\$5180	\$5395	\$5515	

OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.

AUSTIN 486/33 WINSTATION 8MB RAM AND 1 FLOPPY DRIVE STARTING AT \$5890 OR \$177 PER MO.				
CHOOSE MONITOR BELOW				
CHOOSE HARD DRIVE BELOW	VGA MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
330MB SCSI	\$6730	\$6945	\$7065	
1.2GB SCSI	\$7990	\$8395	\$8515	

OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.

CIRCLE 509 ON READER SERVICE CARD

1-800-752-1577

All Time Zone-Mon-Fri 7am-7pm-Sat 10am-5pm

VAR 1-800-338-1569

GSA 1-800-833-4GSA

FAX (512) 454-1357

OVERSEAS (512) 339-3500

CANADA 1-800-338-1565

NETWORKING 1-800-874-7182



DUSTIN UPGRADES YOU TO BUSINESS CLASS.



ACCOUNTING/FINANCE

ACC PAC BPI	259.
DAC Accounting 4.1	89.
DAC Bonus Pack 4.1	145.
J.K. Lasser Income Tax	131.
Managing Your Money	49.
Market Analyzer +	265.
Moneycounts	35.
Peachtree III	159.
Peachtree III w/DQ	235.
Quicklan 4.0	45.
Rapid Tax	49.
Timeslips III	205.
Turbo Tax	49.

SOFTWARE

Borland C++	349.
Paradox 3.5	379.
Paradox Engine	355.
Paradox Network	699.
Paradox 3.5	379.
Paradox Upgrade	139.
Objectvision For Windows	89.
Objectvision Runtime	349.
Quattro	119.
Quattro Pro	329.
Quattro Pro Upgrade	95.
Reflex 2.0	179.
Reflex 3.0	161.
Sprint	139.
Turbo C++ 2nd Edition	85.
Turbo Debugger & Tools	115.
Turbo Pascal Windows	Call

BUSINESS GRAPHICS

Applause II	249.
Calendar Creator Plus	45.
Charisma	349.
Draw Perfect	139.
Easy Flow	109.
Flowcharting III	149.
Form Filler	89.
Form Publisher Windows	145.
Form Tool Gold	65.
Freelance Plus	339.
GB Executive	159.
Harvard Graphics	319.
Hijaak	115.
Hotshot Graphics	149.
Impress 2L	75.
Inset + Hijaak	135.
Jeform Design	289.
Labels Unlimited	45.
ORG Plus Advanced	75.
Perform 2L	109.
Perform Professional	289.
Presentation Team 2.0	349.
Storyboard Live	299.

CAD/DRAFTING

3D Drafting	219.
Autosketch 3.0	159.
Generic CADD 5.0	249.
Design CAD	159.
Design CAD 3D	209.
Drafix For Windows	449.
Drafix Ultra	259.
TurboCAD	85.

COMMUNICATION

Carbon Copy +	125.
Carbon Copy + Host	139.
CO Session	109.
Crosstalk Communicator	59.
Crosstalk Mk IV	149.
Crosstalk Windows	129.
Crosstalk XVI	119.
Hayes 2400 Int.	329.
Hayes 2400 Ext.	365.
Laplink III	99.
PC Anywhere III	69.
PC Anywhere IV	109.
Procomm Plus 2.0	75.
Smartcom III	149.
Smartterm 240	205.
Smartterm 320	119.
Softterm PC	135.
Take Over	175.

DATABASE

ACT	235.
Ask Sam 5.0	239.
Clarion Personal	55.
Clarion Professional	495.
Clipper 5.0	539.
Data Perfect	289.
DBase IV	519.
DBase IV Developers	865.
DBase IV Lan	659.
DBXL	149.
Foxbase +	199.
Foxbase + Lan	309.
Foxbase + Lan	359.
Runtime	259.
Foxpro	479.
Foxpro Lan	659.
Foxpro Runtime	309.
Paradox Engine	855.
PC File 5.0	95.
Personal R:Base	95.
Q & A	245.
Quicksilver	349.
Rapidfile	105.
R Base 3.1	509.
SCO Foxbase + 286	725.
SCO Foxbase + 386	725.
SQL Windows	899.
Superbase 2	219.
Superbase 4 Windows	449.

BOOKS/PUBLISHING

Artline 2.0	419.
25 In One	289.
Catchword	149.
Corel Draw 2.0	399.
Designer	489.
Express Publisher	99.
First Publisher	109.
Fontasy III	49.
Freedom Of The Press	259.
Gem Desktop Publisher	179.
Gem Draw Plus	215.
Go Script Plus	199.
Graphics Composer	269.
Graphics Editor	449.
Grasp	125.
Headlines In A Cartridge	219.
Jetpage	349.
Onnipeg 386	495.
Pacific Page	389.
Pacific Page Personal	389.
Pagemaker	499.
Pagemaker Mac	539.
PC Paintbrush IV +	119.
Pizzazz +	75.
Printmaster Plus	42.
Printshop	45.
Publish It 1.2	149.
Publishers Type Foundry	319.
Readright	319.
Readright Personal	169.
Readright Windows	325.
Show Partner F/X	235.
Soft Type	119.
Super Cartridge 2	389.
Super Cartridge 3	439.
Superst +	299.
The Animator	249.
Ultra Script PC Plus	265.
Ventura Gold 3.0	569.

INFORMATION/PROJECT

MANAGEMENT	
Address Book Plus	55.
Agenda 2.0	309.
Business Contacts	59.
CA Project 2.0	589.
Current	239.
Grandview	209.
Harvard Project	
Manager	449.
Idea Fisher	529.
MaxThink	49.
Plan Perfect	289.
Professional Plan	79.
Project Scheduler V	485.

Timeline 4.0	479.
Top Priority	65.
Who-What-When	185.
WP Office 5 User	335.
WP Office PC	89.

INTEGRATED

First Choice	119.
Framework III	469.
Lotus Works	109.
MS Works	99.
Open Access III	409.
Smartware II	469.
Smart System Xenix	899.
Symphony 2.2	529.

MATHEMATICAL

Derive	149.
Mathematica 386	599.
Mathematica 386/387	599.
Mathcad	329.
SPSS/PC +	569.
Statgraphics	575.
Grapher	149.
Sigma Plot	489.
Plot It	345.

MICROSOFT

MS Basic	349.
MS C Compiler	349.
MS Chart	285.
MS Dos 3.3	79.
MS Dos 4.01	79.
MS Excel 3.0	329.
MS Flight Simulator	45.
MS Fortran	319.
MS Macro Assembler	109.
MS Mouse with Paint	109.
MS Windows 3.0	149.
MS Windows Dev	345.
MS Toolkit	345.
MS Word 5.5	239.
MS Word Windows	339.

OPERATING SYSTEMS

Concurrent DOS 386	295.
Dr. DOS	149.
MS DOS 3.3	79.
MS DOS 4.01	79.
Novell (all products)	Call
OS/2 Pres Mgr Toolkit	359.
OS/2 Standard	319.
PC DOS 3.3	135.
PC DOS 4.01	135.
PC MOS 5 User	449.
SCO VP/IX	365.
Unix 386 Development	725.
Unix 386 Operating	659.
VM 386	145.
VM 386 Multi User	575.
Xenix 286 Operating	459.
Xenix 386 Operating	615.

PROGRAMMING

Actor	829.
APL Plus	459.
Brief	209.
Case PM	1999.
Clear + For C	139.
Halo 88	269.
Owl Guide	399.
RM Cobol 85	799.
Smalltalk V286	129.
Smalltalk VPM	299.
Smalltalk Windows	299.
Toolbook Windows	309.
Turbo C Tools	109.
Turbo Professional	105.
UI Programmer	349.

SPREADSHEETS

MS Excel 3.0	329.
Lotus 123 ver. 2.2	339.
Lotus 123 ver. 3.1	419.
Lotus Upgrade	139.
Quattro	89.
Quattro Pro	329.
Quattro Pro Upgrade	95.
SCO Professional	579.
Supercalc V	319.
Wingz PC	339.

UTILITIES

386 Max 5.1	79.
Above Disk	69.
Allways	119.
Auto Menu	45.
Baler	359.
Blue Max	85.
Check It	95.
Control Room	75.
Copywrite	65.
Cubit	45.
Desqview	79.
Desqview 386	129.
Direct Access	69.
Disk Manager	45.
Disk Technician Gold	109.
DS Back-Up	49.
Fast	69.
Fastback Plus	119.
First Apps	59.
Icon Designer	39.
Info Select	69.
Intelligent Back-Up	89.
K Edit	109.
Mace 1990	95.
Magellan	115.
MKS Toolkit	225.
Norton Utilities 5.0	119.
Norton Back-Up	109.
Norton Commander	109.
Norton Editor	59.
Option Board Deluxe	119.
P Link 86	289.
PC Back-Up	75.
PC Kwik Powerdisk	49.
PC Tools 6.0	89.
PK Zip	45.
Pop Drop Plus	65.
Print A Plot	189.
Print Cache	109.
Print Q	85.
Q Dos II	42.
QEMM 386	62.
GRAM	55.
Scrapbook +	109.
Sideways	59.
Software Bridge	79.
SPF/PC	165.
Spiritrite 2	69.
Switch It	69.
Turbo EMS	59.
Windows Express	59.
Wonder Plus	55.
X Tree Net	169.
XTree Pro Gold 2.0	99.
@ Liberty	179.

WORD PROCESSING

AMI Professional	319.
CHI Writer Deluxe	255.
Grammatik IV	55.
Grammatik IV-Windows	55.
Language Master	65.
Manuscript	345.
Multimate 4.0	259.
Nota Bene	339.
Professional Write	169.
Rightwriter 4.0	65.
Word For Word Pro	89.
Wordperfect 5.1	249.
Wordperfect Add On	179.
Wordstar 6.0	289.
Wordstar Legacy	285.

Buying software is a lot like traveling by airplane. The important thing is not only what you buy, or where you go, but how you're treated along the way. Many companies will give you premium service only for a premium price, while others offer a no-frills price that usually results in a no-thrills experience. Either way, you shouldn't have to choose between service and savings.

At Dustin Discount Software, we offer you much more than a wing and a prayer.

Like all the latest titles for your PC. Full manufacturers' warranties. Free ground shipping. No minimum orders. And, best of all, extremely low prices.

As one of the largest IBM software dealers in the world, we at Dustin Discount Software are dedicated to providing all of our customers with premium service at the lowest available price. And with thousands of software items in stock, we back up our commitment to our customers by offering a tremendous selection.

So, if you're ready to be upgraded to business class service, call Dustin Discount Software. And get ready to take off.

THE DUSTIN DIFFERENCE:

- ✓ Free Ground Shipping
- ✓ Same Day Shipping
- ✓ Overnight Delivery Available
- ✓ Corporate PO's Welcome
- ✓ APO's & FPO's Welcome
- ✓ Government & Educational Pricing
- ✓ No Minimum Orders
- ✓ Visa, MasterCard, & AMEX Accepted
- ✓ No Credit Card Charges Until Shipping
- ✓ No Credit Card Surcharges
- ✓ Thousands of Items in Stock
- ✓ The Latest Software Versions for your PC
- ✓ Manufacturers' Warranties & Documentation
- ✓ Call for Items Not Listed & Free Catalogue



Plain Wrap Prices,
Black Tie Service.

CIRCLE 347 ON READER SERVICE CARD
To order, call us Toll-Free
from anywhere in the United States.

1-800-274-6611

And while you're on the phone,
ask us for a Free Dustin catalogue.
Tel: 818-710-9174 FAX: 818-884-5310

We will promptly replace any defective items returned within 30 days, but cannot guarantee compatibility. There is a 15% restocking fee on any non-defective, unopened goods, and all returns must be accompanied by a Returned Merchandise Authorization. Software prices do sometimes fluctuate beyond our control and may change, for better or worse, without notice. While ground shipments are free, we do ask \$11.00 per item for 2-day, \$22.00 per item for overnight, and \$4.50 for C.O.D. Although shipping heavier items may be slightly more, bulk orders can be a lot less. Free catalogues are available upon request, and please call us for any item not listed. Dustin Discount Software is open Monday thru Friday from 7:00 AM to 5:00 PM PST. We are located at: 20969 Ventura Blvd., Suite 13, Woodland Hills, CA 91364.

Letters

SPEAKING OUT AGAINST WINDOWS

Finally, John Dvorak speaks out against GUIs and *Windows* ("Windows, the Mac, and DOS," January 29, 1991). It's about time someone at *PC Magazine* finally woke up to the pitfalls and shortcomings of *Windows*. With all the many hoopla articles you've written, I began to believe that you were a Microsoft-owned publication.

To those of us who had been using *DESQview* for years before *Windows 3.0* was released, Microsoft had nothing functionally new to offer (who needs the simple GUI anyway?). Thank you, John Dvorak, for telling it like it is.

Phillip A. Rodokanakis
Herndon, Virginia

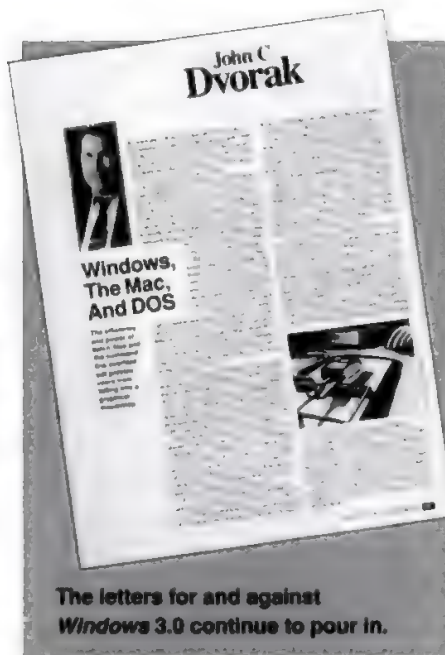
I would like to congratulate your editorial staff on the fine sense of humor and irony in following your laudatory comments about *GeoWorks Ensemble* with the unbelievable comments about *Windows 3.0*: "It maximizes the use of your hardware" ("7th Annual Awards for Technical Excellence," Operating Environments, January 15, 1991, page 122). How can any sane individual, let alone any responsible computer journalist, make such a ridiculous statement about an interface that is a memory hog, slows hardware down to a crawl, and requires a machine more expensive than many of us can afford in order to even run?

I sincerely hope that *GeoWorks* takes off like a rocket and makes a real dent in the market. In many ways, it's what *Windows* should have been.

Harwood W. Loomis
Woodbridge, Connecticut

I'm sure that most of you and your readers have tired of this subject, but I would like to throw in an observation from my experience in working with both *Windows 3.0* and OS/2.

First, I have been a *Windows* user for several years and firmly believe that the GUI interface is the right direction in computing. Secondly, like most users, I



have suffered through the various hardware and software tricks designed to overcome the 640K limitation. Consequently, I do not wish to find myself boxed in again by an underestimation of the needs of the user.

I find myself rereading some of Mr. Petzold's articles and realize that I should have paid more attention to his points. In agreement with his characterization of the differences between the two systems, I find the decision of operating systems to be akin to offering hungry users a *Windows 3.0* Snickers bar immediately, or a full-course OS/2 meal of meat and potatoes in 20 minutes. *Windows* is an immediately satisfying experience, but I can't live off it.

What we need are inexpensive duplicates of the wonderful applications available for *Windows 3.0* in OS/2 format. I hope that our programmers and marketers can see this coming and will be able to make our path to OS/2 less difficult.

Jerry B. Warner
Fort Leavenworth, Kansas

Recently, there have been many articles on operating systems and environments

discussing the political and business decisions IBM and Microsoft have made on OS/2 and *Windows*. From my standpoint as an end user, these articles have missed one important point. Product decisions are made based on sales, and the sales are made not because they are the optimum or even very good answers to users' requirements, but because no other alternative exists.

What is an end user to do? My company is not large enough to insist that programs be written for a particular operating system. Is anybody big enough besides IBM and Microsoft? With their infighting I do not believe they can even know where to go, much less say they are in control.

Ramer W. Streed
North Mankato, Minnesota

IBM SHOULD GET WITH THE PROGRAM

About IBM's newly announced XGA video standard—excuse me, I'm not impressed. It's just another case of IBM playing catch up and setting its standards too low. I believe that setting an industry standard should mean getting ahead of the pack, not pushing the standards from behind.

If IBM wants to regain the video adapter business and truly desires to set a new standard, its management and engineering people should target a really high goal—say 1,660 by 1,280, one that's way ahead of any current availability—and design its hardware and firmware to support that.

Then Microsoft and the other software publishers will have to get on the bandwagon, and we will all benefit.

Michael Heavener
Redmond, Washington

IBM looks like it's trying to save a buck at the expense of what's easiest on the eyes—namely, a clearer display. Since many customers focus on eye strain when considering buying a monitor, I think it would be helpful for you to give further guidance recommending or not recom-

THINK OF IT AS
A SCAVENGER HUNT
IN A VERY EXOTIC
NEIGHBORHOOD.

Imagine being sent on a mission to find exotic and obscure artifacts around the globe. You're outfitted with a stack of airplane tickets and a fold-out map designating the 206 cities and 175 countries you've been authorized to visit. Hopping from city to city, you uncover clue after clue, suggesting where to chart your next move.

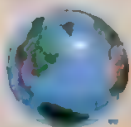


**BUSHBUCK CHARMS,
VIKING SHIPS & DODO EGGS.
THE SOFTWARE GAME PEOPLE
HAVE BEEN SEARCHING FOR.**

A fun and exciting adventure for both school-age kids and adults with a variety of playing options and skill levels. Compete against past scores, friends or any of three challenging characters, including the slimy Otto von Slinkenrat, who is never far from out-hunting you.

Unlike most games made for personal computers, here's one with the ability to increase global knowledge. Instead of exercising your wrist, you'll be exercising your mind.

**ONLY \$49.95 AT YOUR
LOCAL RETAILER, OR CALL
1-800-255-2789.**



PC Globe, Inc.

4700 South McClintock Drive, Tempe, Arizona 85282
(602) 730-9000 Facsimile (602) 968-7196

SOFTWARE FOR EVERYWHERE™

Letters

mending IBM's XGA as the new superior standard for color monitors.

Don Fearheiley
Nashville, Tennessee



The flicker on interlaced monitors is most noticeable with light-colored backgrounds (like *Windows 3.0*) at higher resolutions. Since noninterlaced video solutions are available at comparable prices, we cannot recommend purchasing an interlaced video monitor and graphics card.—Ed.

TRUTH IS STRANGER THAN FICTION

After reading Jim Seymour's article, "Understanding 1990, or Truth Is Stranger than Fiction," ("Best of 1990," January 15, 1991) I'm a little confused as to the truth. In giving a thumbs down to Compaq, Jim stated "Compaq sold few of its innovative Systempros (universal nickname: the Systemslo) this year."

Yet in the same issue, Compaq won the 1990 Technical Excellence Award for the Systempro. Bill Machrone said, "With the Systempro, Compaq has reinvented the file server. The Systempro reaches new levels of system performance and throughput—to the point where server capacity ceases to be an issue for most PC applications."

Truth truly is stranger than fiction.
Andrew Sherman
Kent, Washington

ADVERTISERS GET PRIVILEGED INFO

I have been a subscriber to your fine magazine for over a year now and have noticed something about your publication that has puzzled me. More often than not, it appears that reviews of PC-related products within the magazine's pages are accompanied by closely related commercial advertising on nearby pages. This seems most prevalent in full-blown, large-scale reviews of products from many manufacturers. More often than not, it seems that the manufacturers of products reviewed take out advertising space in the same pages of the review.

Is this just a coincidence, or do these advertisers have advance warning of future reviews? More importantly, do these advertisers know in advance when a fa-

vorable review will be given? If so, couldn't this be construed as a conflict of interest?

Gregory J. Kirsch
Washington, D.C.



PC Magazine publishes an editorial calendar that lists when certain topics will be featured throughout the year. (For example, for this issue, the calendar mentions a review on 20-MHz 386SXs with cache, among other stories.) However, all participants, including advertisers, must wait until the magazine is published to see the actual reviews and to find out how respective products fared and see who receives the Editors' Choice.—Ed.

**Do your advertisers
know in advance
when a favorable
review will be given? If
so, isn't this a conflict
of interest?**



SHOOTING FOR THE MOON
I just got my hands on *Lotus 1-2-3*, Version 3.1 and *Quattro Pro*, Version 2.0, and I wasn't excited about either.

This is what I am looking for: all the features of *1-2-3*, Release 3; the output quality of *Quattro Pro*; ease of obtaining the quality output through the *Windows 3.0* interface (as in the *Word for Windows* I'm using now); Bitstream fonts; print previewing; and *speed*.

The upgrade from 3.0 to 3.1 is a joke, merely an add-in, nothing more. And the compatibility with *Windows* is not so hot either. When will *Lotus* get its act together? We're waiting.

Joseph Miller
Solana Beach, California



486 OR 386?
I was reading the article "Mainstream Muscle" in the December 25, 1990, issue and I'm curious as to whether the tests and cost comparisons took into account the built-in coprocessor in the 486 chip. I am about to buy (in the next few months) a new system, and I want to use it for CAD

IBM, PC XT/AT, PS/2, or compatibles with 40MB RAM, floppy drive or hard disk, DOS 3.0+. Supports Hercules, monochrome VGA, EGA, VGA, Super VGA, or color VGA displays. © 1991 PC Globe, Inc. All rights reserved. Bushbuck Charms, Viking Ships & Dodo Eggs is a trademark of PC Globe, Inc.

CIRCLE 188 ON READER SERVICE CARD

PC WEEK / REVIEWS

PAGE 92

**PC WEEK
LABS**
PRODUCT REVIEW

Tri-Star Leads 33MHz 486 PC Pack

Eight Low-Cost Systems Perform Well; Video and Hard-Disk Components Vary

By David Claiborne

In 1991, \$1,000 could buy the state of...

EIS Technologies Inc., First Computer Systems Inc., Insight Computers, Micro Express, PC Brand Inc., S&S Systems Ltd.

Labs tests that the Conner Peripherals Maxtor and Quantum hard disk drives in...

classing the...

Tri-Star Computer continues to outdistance the pack as America's preferred supplier of high-end 486 Workstations. Read the reviews and you will understand why Tri-Star is the undisputed 486 champ.

"Tri-Star is king of the 33MHz 486 Mountain." PC WEEK Analyst's Choice, February 18, 1991

"Tri-Star's 486/25 rates honorable mention for its thoughtful design touches, two year warranty and excellent service program." PC Magazine Editor's Choice Honorable Mention, September 11, 1990

"Tri-Star's edge is its good documentation and excellent service policy." PC Sources 486/33 Lead Review, February 1991

FLASH CACHE 486 COMPUTERS

FEATURES INCLUDE:

Intel 80486 Processor
8MB RAM (Expandable to 64MB On Board)
64K High Speed Static RAM Cache
210MB 15ms Hard Disk Drive
1.2MB 5.25-inch Floppy Drive
1.44MB 3.5-inch Floppy Drive
1024 x 768 SVGA Adapter w/1MB RAM
14" Non-interlaced SVGA Color Display
Microsoft DOS 4.01 & Windows 3.0
High Res 400 DPI Three Button Mouse
Quality 101-Key Tactile Keyboard
Two Serial Ports and 1 Parallel Port
Fully DOS, UNIX & Novell Compatible

FC425I
\$3895

FC433I
\$4295

UPGRADES:

16" COLOR DISPLAY \$695
20" COLOR DISPLAY \$1695

Flash Cache 33MHz 386 as above with
4MB RAM & 125MB Hard Drive
—Only \$2695

ALL FLASH CACHE COMPUTER SYSTEMS INCLUDE:

- ♦ 2 Year Parts & Labor Warranty
- ♦ 60 Day Money Back Guarantee ♦ 12 Month On-Site Service ♦ Overnight Parts Replacement
- ♦ Lifetime Toll-Free Technical Support

All prices and specifications subject to change without notice. We accept MasterCard & Visa (No Surcharge), AMEX (No Surcharge), or C.O.D. University & Corporate PO's are welcome. (T&H), Flat 25). Money back guarantee does not include shipping charges. On-Site service available in most U.S. locations. 2 Year Warranty includes system and keyboard, non-Tri-Star assembled peripheral items such as printers and monitors are covered for 1 Year. All systems have been certified or certified to comply with part 15 of the FCC rules for a Class A or Class B computing device. FCC Class A systems not intended for home use. FourCAD is a registered trademark of Endline Computing. 386 & 486 are trademarks of Intel Corporation. Product names mentioned herein may be trademarks and/or registered trademarks of their respective companies.


TRI-STAR
COMPUTER CORPORATION

1.800.678-2799

707 West Geneva, Tempe, Arizona 85282

Tech Support 1.800.688-TECH

Telephone 602.829-0584

Fax 602.345-0110

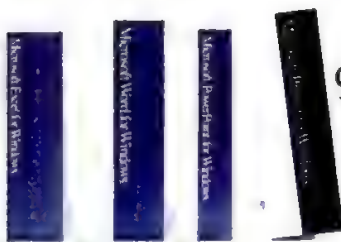
Monday - Friday 7:00am-7:00pm MST

Saturday 9:00am-4:00pm MST

Impress yourself.



(This impression courtesy of Microsoft Excel and Word for Windows.)



When you combine Microsoft Windows™ applications with any Hewlett-Packard® LaserJet III printer, you will not only get excited about your work, but a lot of other people will get excited about the work you do.

You see, Microsoft Windows applications make it possible to do incredible things

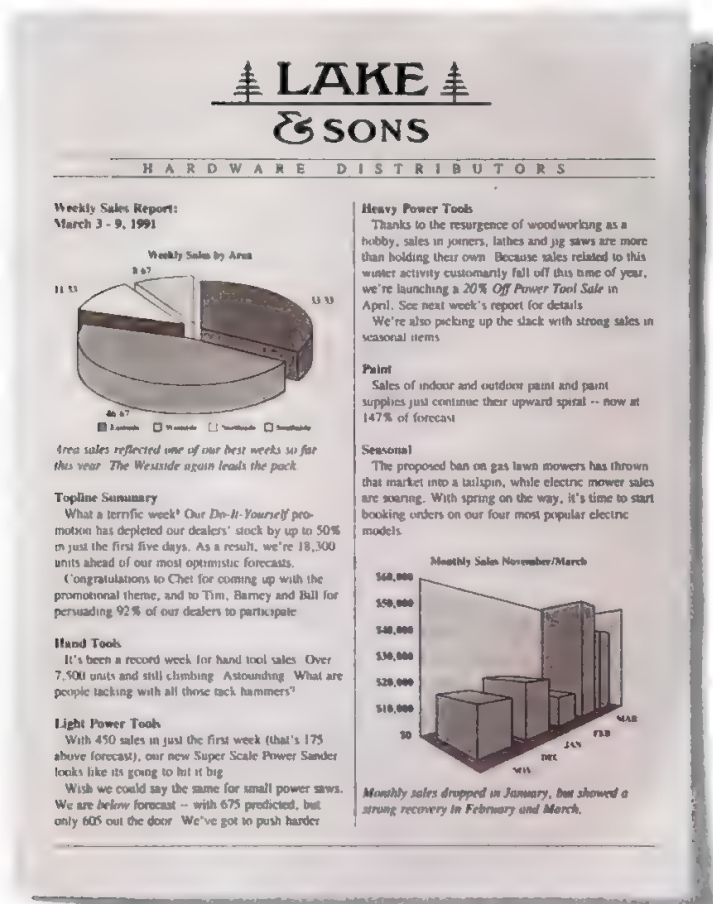
on-screen, while the HP® LaserJet III family lets you print them in all their glory.

This is possible, in part, because Microsoft Windows applications make it easy to format text, data and graphics in a completely WYSIWYG way.

But also because the HP LaserJet III

Microsoft
Making it all make sense®

And everybody else.



(This impression courtesy of the Hewlett-Packard LaserJet III printer.)



The Hewlett-Packard LaserJet III family of printers. The perfect companion to Microsoft Windows applications.

And to ensure that you get crisp, clear out-

comes with scalable fonts supported by our Windows applications. So you get thousands of font choices. As well as the ability to print in record speed.

put, HP developed a new technology they call Resolution Enhancement. But you'll call it simply amazing.

To learn more about how Microsoft Windows applications and the HP LaserJet III family uniquely work together, call (800) 541-1261, Department Q18.

We think you'll be impressed.



Before You Buy A New Monitor, Take This Simple Screen Test.



Compare Hitachi's new 14MVX against the best selling 14-inch multi-scanning monitor.

You'll find sharper text and graphics. A brighter display. And a better price.

You'll also find state-of-the-art anti-glare treatment and lower electrostatic and electromagnetic emissions. Plus full compatibility with VGA, Super VGA, 8514/A and Mac II standards.

So give the 14MVX your own screen test. With sharper graphics and an \$895 list, you won't need 3D glasses to see which monitor is the best buy. Call Hitachi/NSA for the clear details. (800) 441-4832

NEW - LMF version available
Meets world's toughest emission standards.



NSA
NEOSHI SANKYO AMERICA, LTD.



HITACHI
CIRCLE 531 ON READER SERVICE CARD

Letters

applications. If I buy a 386 machine, I also must buy a coprocessor chip for the applications I will run. According to the prices I see in the magazine, to add the chip and possibly a cache controller and memory, I

**A human copy editor
can easily outperform
any grammar-checking
program.**

am almost up to the cost of the 486. It was not clear to me whether your testers figured the extra expense into the chart shown.

Andrew Ameden
Minersville, Pennsylvania

PC If you use CAD applications, it may be worth your while to buy a 486, since CAD applications will utilize the added throughput. But compare the prices of 33-MHz 386s with coprocessors ("Mainstream Muscle," December 25, 1990) versus 25-MHz 486s ("The First 24 486/25 PCs," September 11, 1990) and 33-MHz 486 PCs ("Maximum Performance," February 12, 1991).—Ed.

ARE WE BIASED?

I'm curious to know if *PC Magazine* will ever come out "against" IBM's PCs and PS/2s in favor of the lower-priced and usually better-quality clones. I personally am having quite a time convincing certain of my clients that IBM's PCs are not as good or as powerful as many clones for the money. I feel that my clients often fall prey to savvy marketing, and consequently end up paying more for name brands. But for those of us who can, we'd just as soon buy the name-brand components ourselves, assemble them, and put out the same quality box as IBM does, without the name-brand cost. I'm sure that *PC Magazine* has some thoughts on this matter. But can it afford to express them?

Dana Friedman
Brooklyn, New York

PC A regular component of our comparative reviews is an Editors' Choice selection. If you look at the recent winners, you find that we select the products that give the best combination of price, performance, and value, regardless of the manufacturer.—Ed.

HUMANS FOR SALE

You did an article on grammar checker programs ("It's Not What You Say But How You Say It" sidebar to our December 11, 1990, cover story, "Word Processors: The Best and the Brightest").

In the sidebar you did not give the address and price of "Glen Becker." I would appreciate your sending me that information.

L. W. Wigley
Friendswood, Texas

PC Sorry, I'm not for sale. In case you read the article too quickly, the author's point was that a competent human copy editor can easily outperform any of the grammar-checking programs on the market.—Glen Becker, copy chief at *PC Magazine*

CORRECTIONS & AMPLIFICATIONS

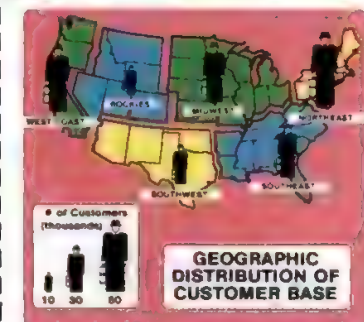
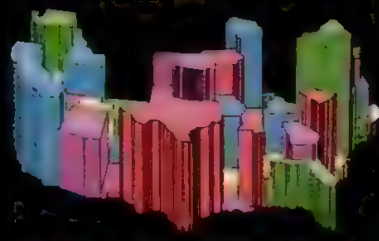
In our review of LAN e-mail products in the November 27, 1990, issue, we should have stated the prices for *WordPerfect Office* as follows: with a five-user license, \$495; the *Office PC LAN 20-Pack*, \$1,595; *Office PC* (a package that allows the addition of a single network station to either of the above products), \$149.

Jim Molenda of GRiD Systems was inadvertently omitted from the engineering team of the GRiDCASE 1550sx. ("7th Annual Awards for Technical Excellence," Design, January 15, 1991.) Molenda served as the group project leader.

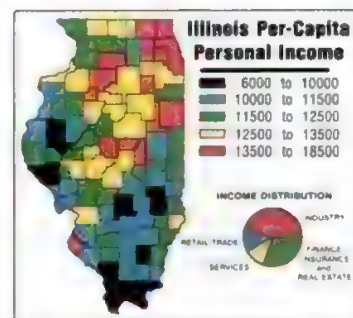
HOW TO WRITE TO PC MAGAZINE

We welcome your comments, complaints, insights, and suggestions. Please send them to Letters, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 8 for access information). All letters become the property of *PC Magazine* and are subject to editing.

DESKTOP MAPPING



Create Symbol Maps in proportion to your data, scaled in the horizontal direction, vertical direction, or both. You can use the built-in symbols, create your own, or import symbols from other applications using the Windows Clipboard.



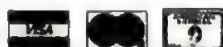
MapViewer™ supports multiple layers, allowing you to combine different map types (Hatch Maps, Dot Density Maps, Pie Maps, Symbol Maps, and Prism Maps) into a single map. Use data files created with other programs including Lotus 1-2-3, Microsoft Excel, and standard ASCII files.

MapViewer™ comes with boundary files for the countries of the world, all 50 states, and all the counties in the U.S. There is no need to purchase additional boundary files or data sets. Everything you need to create stunning full-color maps is included in one low price. In addition, Golden Software provides TOLL-FREE technical support in the U.S.

MapViewer™ ... \$240
Working Model
Demo ... \$10

FREE BROCHURE
Call Toll-Free
1-800-972-1021

or (303) 279-1021
FAX: (303) 279-0909



MICROSOFT
WINDOWS
Version 3.11 compatible Product

Requires
Windows
3.0

GOLDEN SOFTWARE, INC.
809 14th St., Golden, CO 80401

dFacts Are In.

DATABASE COMPARISON TABLE	dBASE IV version 1.1	Paradox version 3.5	FoxPro version 1.02
EASE OF USE			
Control Center organizes data, queries, forms, reports, labels, applications on one screen	Yes	No	No
Create applications <i>without programming</i>	Yes	Yes	No
Modern pulldown menus for all Design Tools	Yes	No	Limited
Query by Example (QBE) for easy access to information	Yes	Yes	No
Context specific help by menu item	Yes	No	No
PRODUCTIVITY			
Quick Layout for automatic forms, reports and labels	Yes	No	Yes
Application Generator for quick application development	Yes	Yes	No
Automatic code generation for all Design Tools	Yes	No	No
Automatic maintenance of multiple indexes for ordering data	Yes	No	No
Memo fields for notes, letters, descriptions	Yes	No	Yes
POWER & FLEXIBILITY			
Bold, underline, italic, subscript, superscript text for high impact reports and labels	Yes	No	No
User Defined Functions for extending programming language	Yes	No	Yes
Data input validity checking in forms	Yes	Yes	Yes
Multi-user transaction processing ensures data integrity	Yes	No	No
Number of file formats imported/exported	7	6	3
INDUSTRY STANDARDS			
#1 Selling, #1 Rated multiuser database; over 3 million users (1)(2)	Yes	No	No
Compatible with dBASE III PLUS data and applications	Yes	No	Yes
Compatible versions for DOS, VAX VMS, Macintosh, SunOS and other UNIX platforms (3)	Yes	No	Limited
Structured Query Language (SQL) integrated with programming language	Yes	No	No

(1) dBASE III PLUS and dBASE IV comprise approximately 55% of PC database systems sold - 3 times nearest competitor according to the most recent report by the market research firm Audits & Surveys (Oct. 1990). (2) Software Digest rated dBASE IV #1 among multiuser databases (October 1990). (3) Versions of dBASE IV are shipping for DOS VAX and SunOS Macintosh and other UNIX Platforms are announced.

Based on what our customers tell us, we made a list of some of the most important features to look for in data management software.

Then we compared the new dBASE IV® version 1.1 with two other database products.

As you can see, dBASE IV offers exclusive advantages in

many categories.

For instance, only dBASE IV lets you access all its functions from a single screen. Called the Control Center, this screen lets you manage existing data, and create new tables, queries, reports, forms and labels totally without programming.

When all the facts are on the table, it's easy to see which database software is best.

Of course we aren't the only ones who have come to this particular conclusion.

Software Digest rates dBASE IV version 1.1 the #1 Multiuser Database (Vol. 7, No. 13, Oct. '90).

dTruth Comes Out.

Software Digest **RATINGS REPORT**
 Volume 2 Number 13
 The Independent Comparative Ratings Report for Selecting IBM PC Business Software

MULTIUSER DATABASE PROGRAMS

Ratings Key: ■ 7.0-10.0 ■ 5.0-6.9 ■ under 5.0

Software Digest Rating	Overall Evaluation	Overall Power	Program Name	Version Tested	Performance	Veratility	Error Handling	Ease of Learning	Ease of Use	Memory Requirement	Price	Volume Purchase Agreements	Page
***	7.0	6.7	dBase IV	1.1	■	■	■	■	■	450KB	\$795	✓	28
**	6.8	5.1	Paradox	3.5	■	■	■	■	■	640KB	\$995	✓	32
**	6.8	7.1	FoxPro/LAN	1.02	■	■	■	■	■	512KB	\$1,095	✓	30
**	6.4	5.1	DataEase	4.2	■	■	■	■	■	640KB	\$750	✓	26
*	5.8	3.6	R:Base	3.0	■	■	■	■	■	520KB	\$995	✓	34
*	5.7	6.0	Clarion Professional Developer	2.1	■	■	■	■	■	512KB	\$845	✓	24
*	5.7	6.6	Advanced Revelation	2.01	■	■	■	■	■	640KB	\$995	✓	22

REPRODUCTION OR QUOTATION IN WHOLE OR IN PART IS PROHIBITED WITHOUT PRIOR WRITTEN PERMISSION
 All rights reserved. © 1990 by NSTL, Inc. Plymouth Corporate Center Plymouth Meeting, PA 19462 800-223-7083

Perhaps the most independent publication in the industry, *Software Digest* accepts no advertising whatsoever. Corporations pay hundreds of dollars a year to receive their monthly reviews—which are considered highly unbiased and objective. Their exhaustive, 75-page report concludes:

"Among the top ranking programs, dBASE IV (version 1.1) is the most well-rounded, with solid performance, versatility, and usability." Commenting on speed, *Software Digest* points out that "dBASE IV produces all three test reports as fast as or faster than FoxPro/LAN." As for Ease of Use and Ease of Learning, dBASE IV scored in the Excellent Range as many times as any other multiuser database product tested.

For a free evaluation kit, including competitive details and a free demo disk, call toll-free:

1-800-437-4329 ext. 1416
 Better yet, call 1-800-2ASHTON to upgrade to the new dBASE IV now.



The truth is, no other database can do so much to improve productivity.

 Ashton-Tate

All the monitors you'll need for

What you see is the remarkable MultiSync® 3D color monitor from
NEC. What you don't see is how this one 14" monitor can accommodate
not only the broadest range of current mainstream standards, but also
the next standards to become
mainstream—8514/A and
XGA, with brilliant color
resolution of 1024 x 768.

Built around our award-
winning multiple fre-
quency technology, this
one monitor automatically adjusts to frequencies from CGA all the
way up to 8514/A and XGA. Which means even if you haven't moved
up to 8514/A or XGA yet, you have the opportunity to purchase a
monitor through foresight, rather than hindsight.



MultiSync is a registered trademark of NEC Technologies, Inc.

IBM PC/XT/AT, PS/2 and 8514/A are registered trademarks of the International Business Machines Corporation.

Macintosh is a registered trademark of Apple Computer, Inc.



Computers and Communications

all the resolutions you'll need.

Especially since the MultiSync 3D also has a microprocessor-based digital control system that provides automatic screen configuration, lets you select the ideal resolution for your software, and even has a



memory that recalls your preferred screen settings.

And it's also compatible with the IBM PC/XT/AT, PS/2 and the Macintosh computer systems.

Now, since NEC is ready to accommodate even the newest graphics standards to emerge, maybe the real question is: Are you?

NEC is a registered trademark of NEC Corporation

For literature call NEC at 1-800-826-2255. For details, call 1-800-

Macintosh compatibility includes Macintosh II, Ix, Ix+ and SE/30

FONE-NEC. And in Canada, call 1-800-268-3997.

© 1989 NEC Technologies, Inc.

NEC

CIRCLE 153 ON READER SERVICE CARD



Unfortunately, everyone working with your company's data may not be working with your company.

An unsecured PC is an open invitation to trouble. A competitor could steal your most sensitive information. Or a well-meaning employee could accidentally alter or delete important data or leave a virus behind. That's why you need DiskLock.™

DiskLock doesn't let anyone into your system without entering your password. It automatically locks your drive when you turn off your computer, and you can set it to lock when your PC has been idle for a time you've specified.

And when it locks, it locks. DiskLock lets

you choose from three levels of security, including the government standard, DES encryption. That's serious protection.

DiskLock works transparently, so you can work without interruption. You can lock only your drive, or you can lock your drive and individual directories or files. And it automatically records unsuccessful entry attempts.

You won't find better protection for your sensitive data.

To find out more about DiskLock call 1-800-873-4384. Buy DiskLock now. OFFICE 280 ON READER SERVICE CARD.

and get a free locking diskette box. Just write "lock box" on the registration card and return it. This is a limited-time offer, so secure one today.



Fifth Generation Systems, Inc.
10049 N. Reiger Road, Baton Rouge, LA 70809
Technical Support: (504) 291-7283

by
Gus Venditto

Advisor

SWITCHING FROM A DESKTOP TO A PORTABLE WITH OS/2

Although I can run IBM OS/2, Version 1.2, Standard Edition, on my Zeos desktop PC, I have to use Toshiba's version for my T5200 laptop.

If I purchase IBM's portable Model 70, will I be able to use IBM's version of OS/2? If I had to use a version that supports a gas plasma screen, would the Toshiba version operate on the Model 70?

James Cude
Brady, Texas



You're right to be cautious about using the same version of OS/2 on different machines.

In this case, though, you've already succeeded in getting the questionable computer working. IBM confirmed to me that the Model 70 is compatible with OS/2, Version 1.2, as well as the latest release, 1.3.

Even though the Model 70 uses a gas plasma display, it employs standard VGA modes and so there's no need for special OS/2 drivers (the conversion of VGA color to shades of amber is done in hardware).

Toshiba uses a special video mode to display graphics on the T5200; that's why it must have OS/2 drivers that are unique to the machine.

MUSICAL WORD PROCESSORS THAT DO TRANSPOSITIONS

I play the piano and often transpose or rewrite using a simple chord system. I'm looking for a program that will allow me to write and print out sample sheet music.

I have no interest in playing or hearing the output on my system.

Peter Maloney
Skeneateles, New York



The two most important categories of music software are sequencers and notation packages. Sequencers record and play back MIDI instructions that drive synthesizers, while

■ **SWITCHING FROM A DESKTOP TO A PORTABLE WITH OS/2:**
Can a portable IBM Model 70 and a Zeos desktop PC use the same version of OS/2?

■ **MUSICAL WORD PROCESSORS THAT DO TRANSPOSITIONS:**
Several programs that can print sheet music and transpose chords.

■ **RUNNING WINDOWS ON A NETWORK:**
Problems to avoid when running *Windows* under *NetWare*.

notation software outputs printed music entered either manually (using the computer keyboard or a mouse) or through a MIDI keyboard.

Since printed output is most important to you, one of the many available notation packages would probably suit you best. When you buy one of these programs, you'll still get the ability to someday hear the music on a MIDI device, even if you have no need for it now.

At the high end, there are at least two programs, *Score* (\$995 from Passport Designs, 415-726-0280) and *Finale* 2.0 (\$749 from Coda Music Software, 800-843-2066), that amount to musical desktop publishing software. Like other desktop publishing packages, these are powerful, complex, and something of a project to master.

Theme (\$395 from Theme Software Co., 804-971-5963) is not quite as complex but is nevertheless comprehensive enough to handle the notation of a Gregorian chant.

For the kind of work you describe, however, the best choice is probably one of the simplest. *Music Printer Plus* 4.0 (\$595 from Temporal Acuity Products Inc., 800-426-2673) is relatively easy to learn and use. It makes good use of the mouse, reads and writes standard MIDI files, and prints attractive output on dot matrix, ink jet, or laser printers. A simple sequencer allows playback of music on MIDI synthesizers.

RUNNING WINDOWS ON A NETWORK

I make my living as a PC consultant and, although it has not yet been an issue with my customers, I am aware that *Microsoft Windows* is hitting the market in a big way. I'm comfortable with *Windows* use in a single-user environment but need some advice on the best approach for setting up *Windows* in a Novell network environment.

Is *Windows* supported on a network and what hardware issues (RAM, video, and so on) should I be aware of?

Jim Stubanas
Williamsport, Pennsylvania



When Microsoft upgraded *Windows*, it paid special attention to network support. In fact, the standard single-user copy includes a network license.

The first step to making *Windows* work with *NetWare* is to install the most recent release (Version 3.01) of the Novell drivers and shell on both the server and each PC. Your IPX.COM file should have a date of June 1, 1990, or later; and NET3.COM and NET4.COM should have dates of May 8, 1990, or later. (Call Novell at 800-346-7177 if you need the \$30 upgrade.) And make sure you're using the most recent version of the driver software for your network boards.

Run *Windows* off the server only when the server has plenty of excess capacity and where the system administrator is willing and able to take an active role in

Advisor

maintaining the *Windows* directories.

Because individual users will run a combination of files locally and off the server, the potential for confusion is very high: Everyone will start saving configu-

ration files for his or her *Windows* programs, which may interfere with other users if the proper paths are not observed.

The installation options are so elaborate that Novell has prepared a guide called the "Netware and Microsoft Windows Integration Book" (part no. 164-0000-03001); call 800-LAN-KIND to order. There is a fee, but it had not yet been

set as we went to press. It provides details on the best way to install *Windows*: which paths to use, and so on.

You should also know about a minor upgrade to *Windows*, Version 3.0B, that is being distributed by Microsoft technical support for people having network problems. This information and other solutions to network problems are being disseminated by Microsoft through the Microsoft Applications forum on CompuServe. Don't try to administer networked *Windows* without becoming a regular visitor to this forum.

Running *Windows* on local PCs while connected to a network is much easier and offers access to *NetWare* utilities from within a *Windows* application (see Figure 1); all applications that are run under *Windows* will be able to share network directories and printers.

ASK THE ADVISOR

Send your questions to PC Advisor, One Park Avenue, New York, NY 10016 or upload them to PC MagNet (see the instructions for joining on page 8 of this issue). Sorry, but personal replies are not possible.

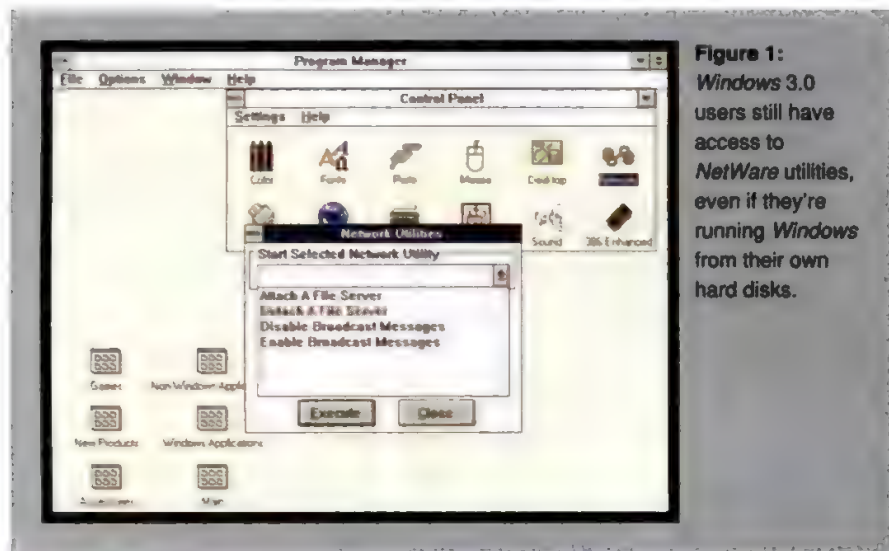


Figure 1: *Windows* 3.0 users still have access to *NetWare* utilities, even if they're running *Windows* from their own hard disks.

TURN YOUR PC INTO AN X WINDOW TERMINAL.

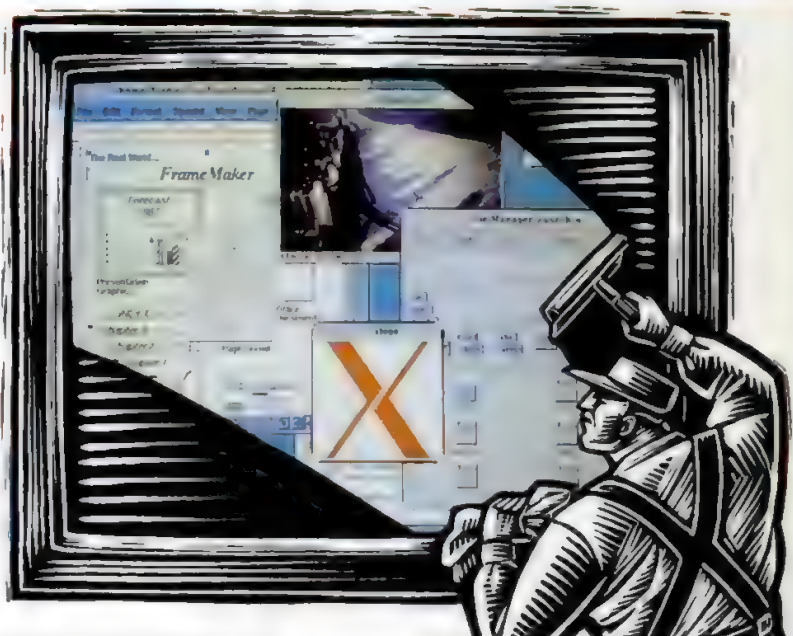
WITH OUR X SOFTWARE,
YOUR PCS BECOME THE PERFECT
SOLUTIONS FOR X WINDOWS.

CALL 1-800-800-9599

SPECTRAGRAPHICS

AVAILABLE FOR DOS AND WINDOWS 3.0

© 1991 SPECTRAGRAPHICS CORPORATION. PC VIEW IS A TRADEMARK OF SPECTRAGRAPHICS CORPORATION. ALL OTHER TRADEMARKS AND COPYRIGHTS ARE KNOWN AND RESPECTED.



CIRCLE 171 ON READER SERVICE CARD

Call Now!
800.423.5897

Thinking of a Notebook?

A few expert opinions:

- PC Magazine, *"There's a new king of the hill—the ZEOS Notebook..."*
- John C. Dvorak, *"In this category I'm most impressed with the ZEOS Notebook...it has to be the number one contender."*
- PC LapTop, *"The notebook you've been waiting for."*
- Infoworld, *"This notebook is a steal."*
- PC Week, *"An outstanding value."*
- Mobile Office, *"The best price performer in its category."*
- Byte, *"The ZEOS Notebook...a clear winner...why settle for less?"*
- Portable Office, *"The ZEOS Notebook...delivers astonishing value...sensational."*
- PC Computing, *"The ZEOS beats the Compaq."*
- Lotus, *"The ZEOS has it all—power, support, good looks."*
- Computer Shopper, *"The ZEOS Notebook...it's the hottest...an excellent value."*
- PC Sources, *"Impressive."*

Think about ZEOS®

CIRCLE 115 ON READER SERVICE CARD

The New ZEOS[®]

Now '386SX Only \$2295!



Notebook.

'286 Only \$1995!

"A NEW KING OF THE HILL"—PC MAGAZINE

PC MAGAZINE SAID IT BEST.

"In the unending battle to become the most functional notebook for the most attractive price, there's a new king of the hill—the Zeos Notebook..." *PC Magazine*. What did they like most?

Everything. As they said, the Zeos Notebook "offers a top notch combination of power, weight, features and price..." In short, everything you're going to appreciate in your new ZEOS notebook.

INCREDIBLE DESKTOP FEATURES IN A NOTEBOOK.

Pick your power. Choose our '286 version or go for the incredible new ZEOS '386SX version. Combine that with our high speed hard disk, built in 1.44MB floppy drive, VGA and more—you've got the greatest notebook going at any price!

Look closely at the details. Like our crisp 10" VGA display. The ultimate in sparkling clarity featuring advanced fluorescent backlighting for vivid VGA graphics. And then the drives.

Two drives are better than one! First, you're getting our whisper quiet high speed, high capacity hard disk. Then we've built in an industry standard 1.44 Megabyte, 3.5 inch floppy as well. And we don't stop there.

DETAILS MAKE THE DIFFERENCE!

For instance, the battery system of your new notebook is the most advanced on the market. You can quick charge, or trickle charge, any time your system is plugged in. Or, you can use the optional charging stand if you wish.

Either way, you're sure to appreciate our light weight snap-in, snap-out battery packs. They're so light and easy to use, you can easily take an extra one with you on those

really long trips. Plus, you can get even more life out of a single charge by using our programmable power management system. Hour upon hour of Notebook computing power!

CONNECTIVITY TOO!

Your new ZEOS notebook is a great connectivity tool! Using our optional built-in 2400 baud MNP Class 5 modem, connectivity buffs will find themselves logging on at every turn.



And speaking of connectivity, we've kept the I/O easy to use too. Because unlike many of the others, your new ZEOS notebook has the same industry standard port connectors you'll find on your larger desktop system. Serial and Parallel ports; even an external VGA connector. Completely compatible!

ZEOS 24 HOUR A DAY SUPPORT.

Don't forget your new ZEOS notebook is backed

by the best Technical and Sales support in the industry, 24 Hours a Day. We're always here to help, *any time* of the day or night. And we don't stop there either.

Your new notebook is also backed by our 30 Day Absolute Satisfaction Money Back Guarantee and One Full Year Limited Warranty. You're going to be very satisfied. We don't just say it. *We guarantee it.*

ORDER YOUR OWN ZEOS NOTEBOOK NOW!

You can order your new ZEOS notebook *right now*. Simply pick up the phone and give us a call now at 800-423-5891. At last, a full featured notebook that lets you compute anywhere. You're going to love it. *That's a guarantee!*

ORDER NOW TOLL FREE:

800-423-5891

NOW. YOUR COMPLETE '286 NOTEBOOK! VGA, 20MB HARD DRIVE, 1.44MB FLOPPY AND MORE. LIGHT AND LOADED! INCREDIBLE.

ONLY \$1995!

386SX ONLY \$2295!

- Genuine Intel® 80286-12 or '386SX-16.
- 1MB DRAM, expandable to 3 or 5MB.
- 20MB High Speed HDD.
- Built in High Density 3.5" 1.44MB floppy drive.
- High resolution VGA display. Fluorescent backlit 640x480, 32 grey scales. Bright and clear!
- Removable quick charge NiCad battery. Two hour plus battery life typical, more using Programmable Power Management!
- Quick charge or trickle charge using included AC power adapter.
- Extra battery packs and external charging stand available.
- 82 key keyboard. True 101 key emulation.
- Industry standard Serial and Parallel Ports.
- VGA port for external VGA color display. Great for demos!
- Total system weight under 7 lbs. with battery.
- 30 Day Absolute Satisfaction Money Back Guarantee and ZEOS Customer Satisfaction Package.
- One Full Year Limited Warranty.
- 24 Hour a Day Toll Free Technical Support, 365 Days a Year.

ORDER NOW TOLL FREE

800-423-5891

FAX Orders: 612-633-1325

Minnesota: 612-633-4591

Hearing Impaired (TDD)

Orders: 800-228-5389

Outside US and Canada:

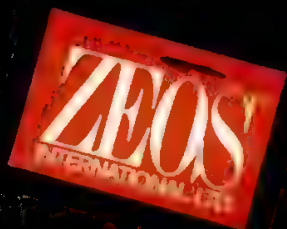
612-633-6131

MasterCard, VISA, Am Exp.

Z-Card and COD.

Open 24 Hours a Day.

365 Days a Year!



Purchase Orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing Programs are available. All prices and specifications are subject to change without notice. Please call to confirm pricing, specifications and warranty details. The following are trademarks of their respective companies: ZEOS (ZEOS International, Ltd.), 286 (Intel Corporation), © 1991, ZEOS International, Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS). CIRCLE 488 ON READER SERVICE CARD

RISC FREE!

Free i860™ Processor and i860/APX Software!

By now, you've probably heard about our industry-first 4860™ MotherBoard that packs the power of the Intel 80486 CPU with the Intel 80860 RISC processor (i486™ + i860 = 4860).

What you haven't heard is that, for a limited time, when you buy a 4860 MotherBoard with 8MB of RAM, Hauppauge will give you an i860 RISC processor and the i860/APX operating system at no additional cost.

Why *give* you this capability? Because you'll enjoy a level of processor performance never before seen in a PC. Our bet is that you'll be so impressed, you'll come back for more!

A PC Revolution: In the PC environment, the 4860 is a 486-based MotherBoard with the new EISA I/O bus. It runs over 2 times faster than 386 computers and delivers mainframe power for applications including CAD, LAN and desktop publishing. This board is fully compatible with DOS, IBM's OS/2, Novell Netware and SCO UNIX. What's more, Hauppauge's 4860 supports up to 64 MBytes of memory *without* a RAM expansion board.

RISC-Y Business: The i860 processor is ideal in complex applications, performing up to 25 million floating-point operations per second. It adds to the power of the 486, so you can run rings around ordinary PCs.



By adapting Intel's APX (Attached Processor Executive) software to our 4860 MotherBoard, we've created a way to exploit the power of the i860 to give you *practical* multiprocessing. In fact, i860/APX

provides a base for entirely new applications made possible by the advent of the i860 RISC processor.

Technical Features: 25 or 33MHZ 486/860 • 4 Mbytes of high speed RAM expandable to 64 Mbytes shared between i486 and i860 processors • Socket for optional Intel Turbo Cache 485™ and Weitek 4167 • 7 EISA I/O slots • 64-bit expansion slot for optional high-speed graphic frame buffer • 1 parallel, 2 serial ports and a built-in PS/2-style mouse port.

Enjoy a RISC-free investment. Our 4860 MotherBoard is designed with the world's highest performing microprocessors. So you can have the world's highest performing PCs and workstations.

For more information, call 1-800-443-6284.

Hauppauge ComputerWorks, Inc.
91 Cabot Court
Hauppauge, New York 11788
Telephone: 516-434-1600
Fax: 516-434-3198
In Europe (49) 2161-17063
In Australia: (7) 262-3122

Hauppauge!

Available at your local computer dealer.

CIRCLE 278 ON READER SERVICE CARD

Trademarks: OS/2: IBM • Intel 386, i486, i860 and Turbo Cache 485™: Intel Corp. • DOS and Xenix: Microsoft Corp. • 4860, 4860 MotherBoard: Hauppauge

First Looks

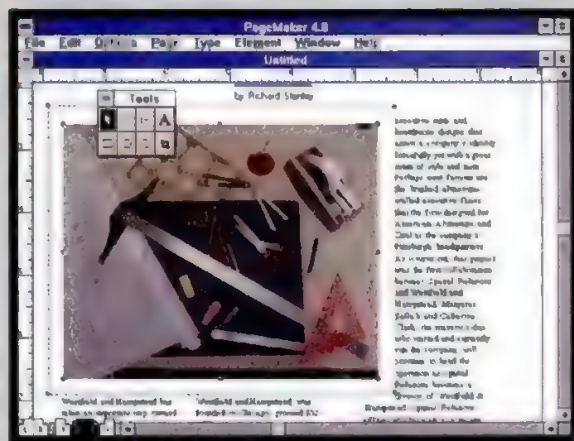
Hands-on Reviews of the Latest Products

PageMaker 4.0 Makes Short Work of Long Documents

HANDS ON
by Luis Simons

When dealing with lengthy, sophisticated documents, a desktop publishing program has to do more than just place graphics and format text. The program must provide tools with which to keep track of multiple text files, high-resolution graphics, and—most importantly—the relationship between the two. At \$795, *PageMaker* 4.0 lives up to that challenge, bringing powerful document management tools, as well as improved design functionality, to the *Windows* 3.0 environment.

PageMaker's new Story Editor could be thought of as a humble text-editing window that provides access to a 100,000-word spell-checker, user-defined dictionaries, and a search-and-replace function. But that narrow view misses this feature's real power. The Story Editor does double duty as a fast



PageMaker now supports scanned 24-bit full color .TIFF and .EPS images. You can display color graphics as grayed out boxes, in normal mode (a low-res 16 color image), or in quality mode.

text formatter. You can search and replace not only text strings, but type styles, and nonprinting characters (such as tabs).

With its new 999-page limit, long documents are *PageMaker* 4.0's long suit. And you can create truly huge documents (up to 9,999 pages) by linking indi-



Q-Print
Peps up *Windows* printing.....36

Borland C++
Scores high marks for *Windows*.....43

AutoShade 2.0
Adds photorealistic rendering44

vidual files via the Book command. The Book dialog box is simple—you merely add file names to a list in the proper chapter order. But it is an essential step if you want consecutive page numbers, an automatic table of contents, or cross-referenced indexes that span multiple files.

Ventura Publisher set the standard for long-document handling, and it still does a few things that *PageMaker* can't—like numbering figures consecutively within a document. However, *PageMaker* 4.0 provides

CONTINUES ON PAGE 34

Zeos and Dataworld SX Notebooks: Easy on the Road and the Pocket

\$2,295 Zeos Notebook 386

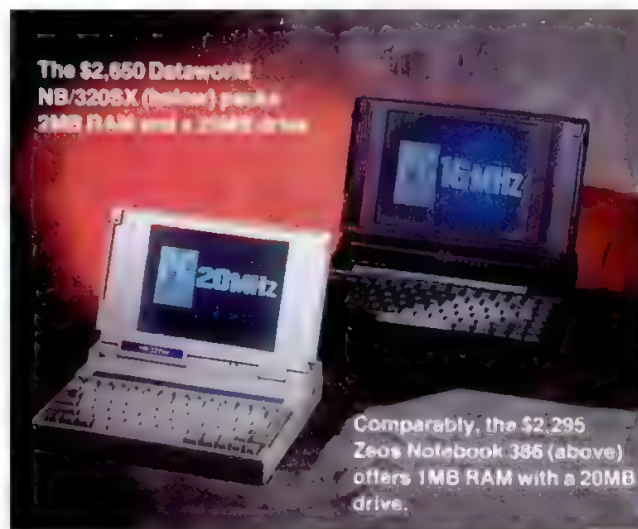
HANDS ON
by Matt Jones

Like the \$1,995 Notebook 286 before it, the Zeos Notebook 386 targets a specific class: Those who want a quality notebook at the lowest price. The price for a 16-MHz 386SX laptop with a backlit VGA display, 20MB hard disk, and floppy

disk is \$2,295, plus shipping.

Aside from the faster, 386-class processor, Zeos has left its popular notebook entry essentially unchanged. The 8-shade VGA display is still 9.5 inches diagonally; the keyboard still feels better than most notebooks; and the 1.1-pound nickel cadmium battery pack still powers it for about a half hour longer than the 2-hour Zeos rating. In our testing, the machine ran for

CONTINUES ON PAGE 35



First Looks

PageMaker 4.0

CONTINUED FROM PAGE 33

several laudable convenience features. For example, it does not expect you to remember and retype every index entry occurrence. Instead, it generates an interim list of topics from which you can point and click on the appropriate reference. Similarly, you can create a table of contents in one fell swoop: Just define a type style that contains the "include in table of contents" command as part of the paragraph spec.

If you are always updating *PageMaker* publications, you'll be thrilled by the new linking options. Instead of tediously re-importing an element each time it changes, you can instruct *PageMaker* to automatically update your document from an external file stored on disk. With the correct options checked, *PageMaker* can even alert you that you have edited copy within the Story Editor and that the changes made internally will be lost if you accept the update from the external file.

This is a wonderful feature for workgroup publishing; it ensures that only the most current version of a story, chart, or picture will be used in the final publication. In fact, *PageMaker* makes this scenario possible on a network by taking advantage of a default link directory located in the ALDUS.INI configuration file. So all of the elements

in a publication can be located even after the file has been moved to and from several sub-directories on the server.

Linking is just one of *PageMaker*'s new networking features. No special version is needed to run *PageMaker* 4.0 from a server, and major code components, such as dictionaries and filters, can be shared between users, or with other Aldus products like *Persuasion*. Most importantly, *PageMaker* now has the ability to lock files at the publication level.

A different kind of linking takes place when you use Aldus' bundled Table Editor program. Although *PageMaker* 4.0 doesn't yet utilize true OLE technology, tabular charts created with the Table Editor function in much the same way. Selecting a .TBL or a .WMF image file within *PageMaker* will launch the Table Editor program, and automatically load the associated file.

The Table Editor is like a word processor that uses a spreadsheet paradigm. Rows and columns expand as you type, in order to accommodate perfectly aligned text blocks. The formatting options for type styles and rules are self-explanatory. The Table Editor uses *PageMaker*'s own filters to import dBASE and Lotus 1-2-3 files. Unfortunately, the program could not successfully import the rather small 1-2-3 worksheets *PC Magazine* uses for testing. Publishers who churn out tabular material might be better served by bringing

Microsoft Excel-generated charts directly into *PageMaker* via its new DDE links.

PageMaker publications aren't always long and complex; sometimes they are short and design-intensive. So *PageMaker* 4.0 adds several new graphics capabilities to its already impressive toolbox. Now you can import 24-bit .EPS and .TIF color images for photographic-quality pictures. You can bring *Micrografx Designer* files into *PageMaker* in their native format. And you can insert a piece of art into a document as an in-line graphic—effectively tying the picture to a specific text position.

Though most business users will manage to remain blissfully ignorant of the type specification nuances, *PageMaker* 4.0 gives more control to those who want it. Flashy features, like the ability to rotate text in 90-degree increments, are ultimately less useful than the editable tracking tables (which allow you to change the kerning between letters and words relative to the specified point size) and the set width option (which lets you condense or expand any typeface from 5 to 250 percent).

PageMaker's type controls still fall short of the benchmark established by Quark Xpress on the Mac (which can adjust type in finer increments, and create drop caps automatically). But Version 4.0 delivers a wider range of type sizes (from 4 to 650 points), manual kerning in 1/100th of an em increments, three levels of hyphenation, and



FACT FILE

PageMaker 4.0 for Windows
Aldus Corp., 411 1st Ave.
South, Seattle, WA 98104-
2871; 206-628-2320 (upgrades
only call 800-243-3173).
List Price: \$795, upgrade
\$150.
Requires: 2MB RAM, 20MB
hard disk, Windows 3.0, EGA
graphics or better, a graphics
adapter, mouse.
In Short: *PageMaker*, already
known for high-end design
tools, adds new tools in Version
4.0 to handle long, complex
documents. Automatic
indexing and TOC generation,
built-in network features, and
the ability to handle full-color
images make this a dynamite
upgrade.

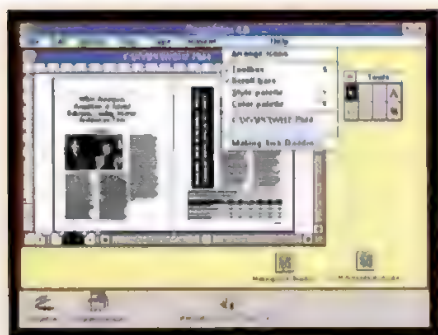
CIRCLE 711 ON READER SERVICE CARD

the ability to automatically align text across columns.

By far the most interesting development on the type front is Aldus' decision to bundle *Adobe Type Manager* with *PageMaker* 4.0. This effectively brings Type 1 scalable font technology to even non-PostScript printers, like the HP LaserJet.

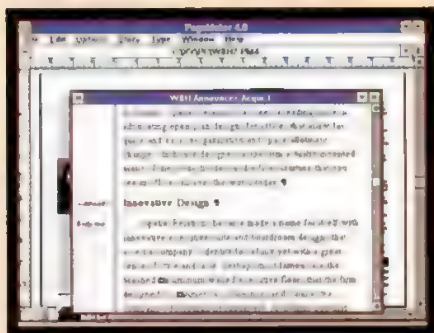
Despite the long wait for Version 4.0, my 4.01 wish list has begun. A companion product to generate professional quality color separations (like *PrePrint* on the Mac) would be wonderful. And now that the dialog boxes for type and paragraph formatting can be three layers deep, a preview box would save time and frustration. In addition, the speed keys and special key combinations need to be fine-tuned. And though many of the import filters for word processing files have been improved (most notably *Word for Windows* and *WordPerfect 5.1*), some filters (like the *Xy-Write* import) have been inexplicably dropped.

On the whole however, *PageMaker* 4.0 proves that its trademark "pasteboard" metaphor can accommodate a complex, lengthy manual as easily as it handles a full color, design-intensive newsletter. Best of all, it can do so without sacrificing the ease of use for which *PageMaker* has always been praised. ■



Powerful icons: The Table Editor icon at bottom is invoked by double-clicking on the chart. The Story Editor icons are part of the document; each represents one article.

The Story Editor displays the type styles of each paragraph (left column), and nonprinting characters. Notice the index entry icon, a white diamond on a black square.



First Looks

Laptops

CONTINUED FROM PAGE 33

a respectable 2 hours and 40 minutes with power conservation features disabled and recharged in about an hour.

Other assets include the 2.5-inch, 23-millisecond Conner Peripherals hard disk; a parallel port, 9-pin serial port, and external VGA monitor port; and the ability to equip the machine with a \$219 internal 2,400 bps modem (V.22bis, V.42, MNP Level 5), \$329 387SX math coprocessor, and up to 5MB of RAM (from its standard 1MB) for an additional \$649.

As for drawbacks, one may be the Notebook 386's size. The Texas Instruments TravelMate

3000 lists for \$5,499 but measures 1.8 by 11 by 8.5 (HWD) inches, smaller than the 2.1 by 12.1 by 9.9 inches of the Notebook 386. The TravelMate 3000 also weighs significantly less—5.8 pounds compared with Zeos' 7.1 pounds (battery and modem included). Add an additional 1.9 pounds for Zeos' auto-switching 110/220 A/C adapter and battery charger.

Other drawbacks for some buyers will be the lack of connectors for external keyboard or numeric keypad, its dim screen, and its battery pack-latching mechanism that makes removal an irksome exercise. Finally, its LCD utilities are poorly implemented. To toggle between reverse and standard video, you must load a TSR program and remember which keystroke combos work in graphics modes

and which work only in text modes.

But the Zeos Notebook 386 represents one of the best values in laptop computers. It is solidly built and priced to sell. Those frustrated by the delivery delays with the Notebook 286 will also be glad to hear of Zeos' new "computers now" program, offering same-day shipment of certain attractively priced bundles. A \$2,795 Notebook 386 bundle includes 3MB RAM, DOS 4.01, a carrying case, the standalone battery charger, and a second battery.

List Price: Zeos Notebook 386, with 1MB RAM, 20MB hard disk, \$2,295 plus shipping; DOS 4.01, \$119. Zeos International Ltd., 530 5th Ave. NW, St. Paul, MN 55112; 800-423-5891 or 612-633-4591.

CIRCLE 712 ON READER SERVICE CARD

paper-white, nonglare cold cathode fluorescent tube backlit tripletwist LCD; the active display measures 8.75 inches diagonally.

There isn't much to like about the NB/320SX's 81-key keyboard layout. It lacks a non-shifted asterisk, PgUp, PgDn, Home, and End keys, and the Up Arrow cursor key is inconveniently placed to the left of the Right Shift key.

To its credit, the NB/320SX includes two 9-pin serial ports, one parallel port, an external VGA monitor port, an external PS/2 compatible keyboard port with an included AT-style keyboard connector adapter, and a bus connector for the optional expansion box.

Though the nickel cadmium battery is rated to last 3.5 to 4 hours, the best time we could obtain on the PC Magazine Labs rundown test was 1 hour 58 minutes and 20 seconds. While less than the rated time, it's not bad, especially since the computer's power management systems were all disabled. A serious drawback, however, is that the system must be turned off to recharge the battery; it requires 2.5 to 3 hours.

The Dataworld NB/320SX utilizes a power management chip set to monitor system activity and is able to reduce battery consumption based on user-configurable settings. For instance, the CPU doze mode sets the processor to its slow speed whenever the system is inactive. A sleep mode cuts power to the CPU, hard drive and display; a suspend/resume button puts the system into sleep mode immediately.

An aggressive price, full set of I/O ports, and inexpensive options make the NB/320SX a strong player. However, the poor keyboard isn't on par with the rest of the computer, and the performance is not especially stellar.

List Price: Dataworld NB/320SX, with 2MB RAM, 20MB hard drive, nylon carrying case, DOS 4.01, *FastLynx* 1.1, \$2,650. Dataworld, 3733 San Gabriel River Pkwy., Pico Rivera, CA 90660-1404; 800-736-3282, 213-695-3777.

CIRCLE 713 ON READER SERVICE CARD

\$2,650 Dataworld NB/320SX

HANDS ON
by Bruce Brown

Another notebook for the price conscious, the Dataworld NB/320SX's base price of \$2,650 includes 2MB RAM, a 20MB hard disk, a 1.44MB floppy disk drive, a backlit VGA display, DOS 4.01, *FastLynx* 1.1, and a nylon carrying case. Two other configurations are available: a Plus system with the computer's maximum 4MB RAM (with 1MB SIMMs; 4MB SIMMs are also available) for \$2,850; and a Super system that adds an internal 2,400-bps MNP Level 5 modem for \$2,995.

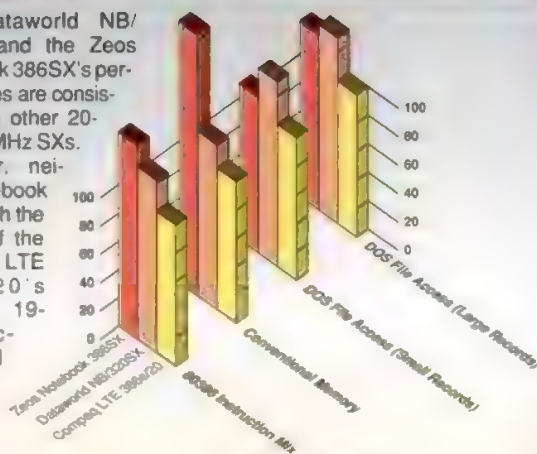
The 7.06-pound (with battery) NB/320SX measures 2.1 by 11 by 8.5 inches. Considering what you get, it's sized just right. The combination AC adapter/battery charger adds 1.56 pounds, and while the six-foot cable is sufficient to reach the wall outlet, the AC adapter to PC cable is only 30 inches long, too short to place the adapter on the floor when using the computer on a desk.

The Dataworld NB/320SX's processor runs at 20 MHz, or 8 MHz in slow mode. The 16 gray-scale VGA display uses a



BENCHMARK TESTS: DATAWORLD NB/320SX, ZEOS NOTEBOOK 386SX

The Dataworld NB/320SX and the Zeos Notebook 386SX's performances are consistent with other 20- and 16-MHz SXs. However, neither notebook can match the speed of the Compaq LTE 386s/20's 30MB, 19-millisecond hard disk.



The **80386 Instruction Mix** benchmark test times a series of tasks specific to the 80386 chip. This test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture.

The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower times can indicate the presence of memory wait states or memory chips rated at slower access speeds.

Relative Times
(Compaq LTE 386s/20 = 100)

The **DOS File Access (Small and Large Records)** benchmark tests time disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. These tests are performed without software disk caching. In addition, the large record segment of the test minimizes the effect of small hardware caches on disk subsystem performance.

Performance Times (Times given in seconds)	80386 Instruc- tion Mix	Conven- tional Memory	DOS File Access (Small Records)	DOS File Access (Large Records)
Zeos Notebook 386SX	4.24	0.83	66.80	7.25
Dataworld NB/320SX	3.76	0.52	78.76	7.64
Compaq LTE 386s/20	3.09	0.45	60.60	5.89

First Looks

Q-Print Accelerator Board Battles Windows Printing



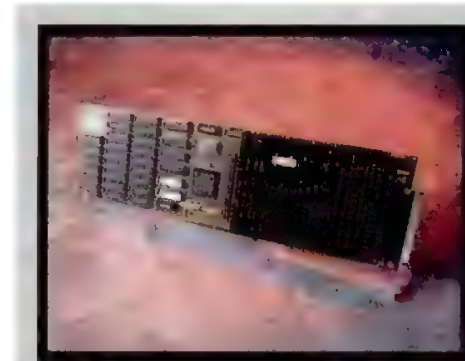
Anyone who prints complex drawings via *Windows* gets used to looking at the hourglass cursor on the screen. Printing vector drawings from applications like *CorelDRAW* can take many minutes, sometimes over an hour; during most of that time there's nothing to do but wait for the hourglass to disappear so you can return to work.

Quintar Co.'s Q-Print is a hardware/software combo that for certain graphics tasks—most notably vector-based drawings—offers an alternative to taking a long coffee break while the printer churns. The Q-Print is a printer accelerator board based on a 50-MHz Texas Instruments TMS34010 graphics coprocessor. The Q-Print

board creates bitmaps (rasterizes the image) and sends them to the printer in the background while you continue with other work.

On the software side, Quintar includes a special OEM version of Zenographics' *SuperPrint*, Version 1.1. The program includes three modules: SuperText, a *Windows* font manager; SuperDriver, a replacement *Windows* driver; and SuperQueue, a *Windows* print manager.

SuperText can create a fixed set of scalable screen fonts or can be used in an on-the-fly mode. Screen fonts are matched with printer fonts for true WYSIWYG text. The font engine works with Adobe Type 1, Bitstream Fontware, Agfa Compugraphic Intellifont, Digital Typeface Nimbus Q, and



Q-Print uses its TMS34010 and a custom version of SuperPrint to speed *Windows*' printing.

Hewlett-Packard soft fonts; 22 typefaces are supplied.

Printing is managed by SuperDriver and SuperQueue. Instead of sending directly to the printer, SuperDriver creates a metafile: a set of instructions to generate lines, curves, filled areas, and text for a drawing. To print, select the Q-Print SuperDriver as the default printer from the *Windows* control panel, and then select file/print from within your application. A pop-up window shows the progress of the metafile creation. Once the file is created, the window disappears; so does the hourglass cursor. You are then free to resume work.

The baton is then passed to SuperQueue, which sends the file to the Q-Print board. The on-board 34010 processor converts the metafile commands into full-page graphics and sends them to the printer.

Besides background printing, there are other advantages to Quintar's scheme. You can automate printing by creating a series of metafiles and sending them to SuperQueue. Network users can create a Q-Print print server that prints metafiles from a shared server directory.

While Q-Print's list of supported printers is brief, it covers a majority of the installed base; it supports the HP LaserJet, DeskJet, PaintJet, and compatibles. It can also work with IBM- or Epson-compatible dot matrix printers, and with a small set of film recorders and thermal color printers, via optional drivers.

Tests conducted using *CorelDRAW* 2.0, *Picture Publisher Plus*, and *Microsoft Windows*' Write clearly show that Q-Print isn't a solution for every

printing situation. Q-Print's forte is vector files. With a moderately complex vector file, *CorelDRAW* generated the SuperDriver metafile in just 9 seconds. The page printed 1 minute and 20 seconds later. When *CorelDRAW* used the standard *Windows* LaserJet driver, it took 5 minutes to print.

On the other hand, Q-Print should be disabled when printing bitmaps or text-intensive work. Not only did a five-page text document take much longer to print with Q-Print, but it generated a 1MB metafile during the process.

Fortunately, it's easy to switch back to the standard print driver and still get some benefit from the Q-Print board. When addressed as a standard printer port, Q-Print's on-board memory is used as a print buffer.

If you work with *Windows* drawing programs, Q-Print could be a productivity boon. At \$495, you might recoup your investment after your first hourglass-icon-free week of work. ■

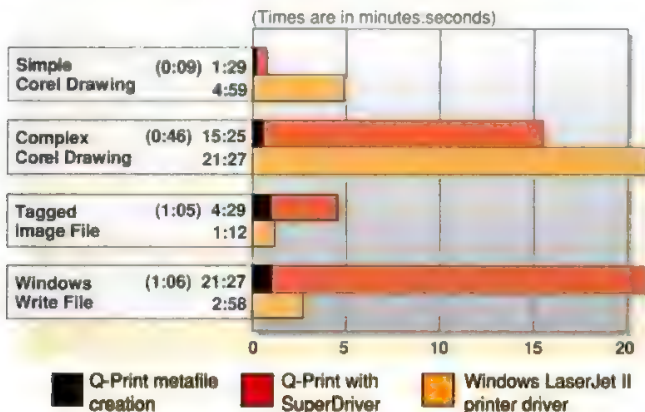


PERFORMANCE TESTS: Q-PRINT

Q-Print greatly speeds the printing of vector graphics files under *Windows* 3.0, but other file formats, such as text files and bitmap images, take significantly longer than standard printing under *Windows* 3.0.

Two results are given for Q-Print. The first is the time necessary to produce a SuperDriver metafile, which is then sent to the printer. The second time indicates when the final page of output exits the printer. Tests were performed on a 33-MHz 386 under *Microsoft Windows* 3.0, using the *Windows*

LaserJet Series II printer driver. The sample files included: a simple and a complex *CorelDraw* vector drawing, a 640 by 480 tagged image file with 256 levels of gray created with *Picture Publisher Plus*, and a five-page text document created with *Windows*' Write using the Times Roman 12-point font.



FACT FILE

Q-Print, Version 1.1

Quintar Co., a division of Bell & Howell, 370 Amapola Ave., #106, Torrance, CA 90501; 800-223-5231. List Price: \$495.

Requires: *Windows* 3.0.

In Short: This T134010-based board and software combo can turbocharge vector output to an HP DeskJet-, PaintJet-, or LaserJet-compatible printer. However, it's not effective for text or bitmapped graphics output.

CIRCLE 434 ON READER SERVICE CARD

You get **G** fonts with the Starter Kit **PLUS A FREE BONUS!**

Text Fonts

- | | |
|---|---|
| ☐ Avant Guard | ☐ Gibraltar |
| ☐ Baskerton | ☐ Jewel |
| ☐ Capelli | ☐ Joulliard |
| ☐ Century | ☐ Katrina |
| ☒ Corporate | ☐ Letter Gothic |
| ☐ Corporate Condensed | ☐ Obelisk |
| ☐ Courier | ☐ Oxford |
| ☐ Eterna | ☐ Padua |
| ☐ Futuri | ☐ Prestige |
| ☐ Garamand | ☒ Roman |
| ☐ Garamand Condensed | ☐ Souvienne |
| ☐ Gazette | ☐ Top Hat |

Decorative Fonts

- | | |
|--|--|
| ☐ Aero | ☐ Gettysburg |
| ☐ Army Black | ☐ Greek AB&f 01 |
| ☐ Bongo Black | ☐ Guthrie |
| ☐ Buckingham | ☐ Harem |
| ☐ Circus | ☐ Manuscript |
| ☐ Classic Typewriter | ☐ New York Deco |
| ☐ Copperfield | ☐ Nuts |
| ☐ Coronation Script | ☐ PENWIN |
| ☐ Dateline | ☒ Rockland |
| ☐ Dateline Condensed | ☐ University Ornate |
| ☐ Diner Script | ☐ Waldorf Script |
| ☐ Don Casual | ☒ Zingbats  |
| ☒ Exchequer Script | |

Glyphix fonts work with WordPerfect 5.0/5.1, unlike any other fonts on the market. They're simple to install and simple to use and right now we're running a special, so there couldn't be a better time to try Glyphix.

Your WordPerfect Fonts menu (Ctrl-F8) will come alive. You'll be able to select a font in any size from 3 to 120 point, and choose from effects like bold, italic, bold italic, reverse, outline or shadowed text. And each font is available in both portrait and landscape and includes a complete international character set. But here's the best news. Glyphix fonts are generated *on-the-fly*, in seconds, when you print. You don't have to do anything... just sit back and admire the results.

The Glyphix Starter Kit includes our unique font management software and the fonts checked above. And everything you need to get started is in the box. No additional printer memory or upgrade is required. If you have a standard LaserJet Plus, II, IIP or III you're in business. And DeskJet owners can use Glyphix too, with our DeskJet version. Once you have our Starter Kit you can buy additional fonts at our everyday low prices. (Text fonts- \$49.95, Decorative fonts- \$24.95)

There's nothing in this fine print that changes our offer or dilutes our guarantee. If you are in anyway dissatisfied with Glyphix performance or quality return the software within 30 days and we'll refund your money. It's really that simple. To use Glyphix you need an IBM PC AT, XT, PS/2 or compatible with a minimum of 512Kb RAM, a hard disk, MS-DOS 3.0 or later, a LaserJet Plus Series II, IIP, III or compatible printer with 512 Kb of printer memory or a DeskJet. WordPerfect is a trademark of WordPerfect Corporation. SWFTE, Glyphix and the font names used in this advertisement are trademarks and/or trademarks of SWFTE International Ltd.

WordPerfect Font Special

FREE BONUS

Order your Glyphix Starter Kit today and pick any font from the Glyphix collection as a **FREE BONUS!**

We're so sure you'll love Glyphix that we offer a 30-day money back guarantee. You risk nothing. If you're not completely satisfied return the software within 30 days for a full refund.

Call today and let us know the size disk you need, if you're a LaserJet or DeskJet user and your free font.

CALL TOLL-FREE.

800-237-9383



Glyphix Starter Kit (\$99.95 plus \$7 S&H for Federal Express)

Includes installation software for WordPerfect 5.0/5.1 and Roman, Corporate, Rockland, Exchequer Script and Zingbats fonts.

CIRCLE 299 ON READER SERVICE CARD

SWFTE International, Ltd
Stone Mill Office Park
724 Yorklyn Road
Hockessin, DE 19707
In Delaware 302-234-1740
FAX Orders 302-234-1760

Swift

First Looks

SAS for OS/2 Brings Mainframe Power to Desktop Statistics

HANDS ON
by Barry Simon

SAS Institute has released Version 6.06 of its statistics software for OS/2. The product, which runs under Presentation Manager, is its first OS/2 version. *SAS for OS/2* (rhymes with bass, not spelled out like SOS) makes excellent use of OS/2's capabilities; it supports a large number of variables and comes with an optional icon-based graphical user interface.

In many ways, this product should be thought of as a replacement for its mainframe version rather than an upgrade of the DOS product. The DOS product is still at Version 6.04, which in SAS Institute's numbering schemes means that there hasn't been an upgrade in over a year. A SAS representative told me that it was unlikely the pure DOS product would ever go beyond 6.04 because of the 640K barrier, although a *Windows* version has been announced, and SAS expects it to ship sometime this year. The changes from the DOS product's 6.04 version to OS/2's

6.06 release include both SQL support and indexing.

OS/2's ability to deal with more memory than DOS not only effects the functions you can build into the code but the data you can process. The DOS version couldn't handle more than 700 or 800 variables (statistics programs use the terms "variable" and "case" where a database would use "field" and "record," respectively) even if you had several megabytes of LIM EMS. The OS/2 version can handle up to 7,500 variables if you have the recommended 8MB of RAM.

While the basic statistical functions will analyze an unlimited number of cases in both versions, there are some procedures, especially graphical procedures, where the OS/2 version imposes less severe limits. This advantage signifies that many *SAS for OS/2* users will be using their machines primarily for SAS; the issue of OS/2's marketplace viability as a general operating system is irrelevant. Moreover, SAS's underlying reliance on platform-independent user-generated

code means that even if OS/2 should lose out in the OS wars, your investment in time and code will be protected.

To describe SAS as merely a statistics program is misleading. The stack of documentation for the modules I looked at was nearly 2 feet high—the base and advanced statistics modules each have over 2,000 pages of documentation, and even the graphics module weighed in at over 1,400 pages. The only word to describe the program is "overwhelming."

Part of any SAS system is the Base SAS module, which costs \$825 for a one-year license and \$360 for additional years. (Unlike most PC software vendors, SAS sells you a "seat" where you pay annually to insure support and upgrades.) Base SAS includes the SAS language, a macro language, a text editor, and two types of SAS language procedures. The first set of procedures is I/O, including data import from *Lotus 1-2-3* worksheets and *dBASE* files, and procedures to display on printer and screen. The second are basic statistics procedures including the standard elementary functions (mean, standard deviation, etc.), sorting, one-way to n-way frequency and cross-tabulation tables, and a large variety of correlation measures and plots done with ASCII characters. There's even a spell-checker included.

Additional modules cost \$625 (\$275 for the renewal license fee), so your initial outlay can easily top \$3,000. Modules include advanced statistics, a matrix manipulation language, a GUI interface, a presentation graphics package, quality control, ETS (econometric and time series analysis), and operation research. Modules that allow you to improve the I/O in your SAS-written programs are also available. There are a total of 11 additional modules.

Most experienced SAS coders will generate their programs in the program editor, but the SAS/Assist module provides a menu, button, and dialog box interface to many procedures and graphical operations. While the last DOS version had a version of SAS/Assist, it is much



FACT FILE

SAS for OS/2, Version 6.06
SAS Institute Inc., SAS
Campus Dr., Cary, NC 27513;
919-677-8000.

List Price License for first year \$825 for Base SAS, additional modules (which require Base SAS) are \$625 each for the first year. Annual renewal license fees are \$360 and \$275 respectively.

Requires 6MB of RAM minimum (8MB or 10MB recommended), OS/2 1.2 or later; math coprocessor recommended, mouse required for some modules, recommended for all. Up to 40MB of disk space.

In Short OS/2 allows SAS to handle the statistical data analysis of very large data sets that previously required the mainframe version. The GUI SAS/Assist interface will somewhat lessen SAS' steep learning curves.

CIRCLE 707 ON READER SERVICE CARD



SAS/Assist, which offers a GUI for many procedures and operations, is slicker in the new OS/2 version than in previous DOS versions.

slicker in the GUI environment. Unlike *SPSS*, whose builder just helps in forming the code, the SAS/Assist module can hide the code completely. If you want to customize the code beyond what Assist allows, a simple sequence of steps will bring the last program that Assist made into the program editor. Since the code is copiously commented, SAS users have the best of both worlds—free-form and menu-driven programming.

My biggest disappointment was using the Assist interface to the SAS/Graph presentation graphics module. The generated graphs could not be changed via direct manipulation of objects. So, for example, you could not double-click on a graph component like an axis and bring up a dialog to modify it. Instead you need to back up to full-screen menus that hide the graph, modify the components using menu screens, and then ask to view the graph again. SAS said that adding direct manipulation of objects was high on the wish list for the next version.

For small- to medium-size statistical data analysis, *SAS for OS/2* is a classy but pricey option. For large data sets now analyzed on a mainframe, SAS is a bargain.

"Worried about where your money goes. Call us and hear how we got organized."

Quicken software pays your bills. Balances your checkbook. Keeps you on budget. Tracks investments. Cuts tax preparation time to minutes. And tells you exactly where your money goes. All in less time—and with less hassle—than you spend on your monthly financial chores now.

Year after year, more people buy Quicken on a friend's recommendation than for any other reason. No wonder it's the world's #1 selling financial software. And now you can hear for yourself what real Quicken customers say about Quicken — just by calling 1-800-438-3500.



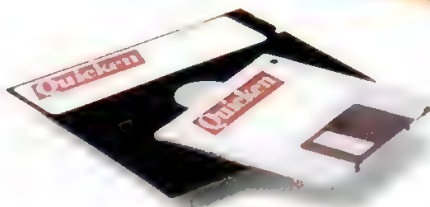
"**This is easy!** I went kicking and screaming to a computer. But one look at that screen and I could see right away where to go and how to step through it. Call us to hear more about how easy it is to use Quicken."

*Dr. and Mrs. Nicholas S. Muff,
Sedro Woolley, WA call and press option 1*



"**I track my IRAs and Keoghs with Quicken reports.** I can kick out a financial statement any time the bank wants it. And in 10 minutes on Dec. 31, I had all the input for my personal taxes ready for my accountant. Call me to hear more about Quicken reports and investment tracking."

*Noel Hanson, Management Consultant,
Pasadena, CA call and press option 2*



Call our customers. Toll-free!

1-800-438-3500

24 hours a day, 7 days a week, U.S. and Canada

Hear from these and other Quicken customers about:

- How easy Quicken is to use.....press 1
- Quicken's preset and customized reports... press 2
- Organizing your finances with Quicken.....press 3
- Quicken's many business uses.....press 4
- How Quicken saves time.....press 5
- To order Quicken or talk to
a customer service representative.....press 9



"**With Quicken I'm in control.** I love it. This is one year I have absolutely no knot in my stomach about spending. With Quicken, I always know where my money goes. Call me to hear more about organizing your finances with Quicken." *Simona Bihl, Assistant Recorder,
Fairfield, CA call and press option 3*



"**I've seen packages for over \$1,000 that don't do all this.** It appears to have endless applications. P&Ls, cash flow, budgets...I don't know what it can't do. Call me to hear more about business uses of Quicken." *Jeff Cornell, Town Auditor, E. Hampstead, NH
call and press option 4*

Intuit

P.O. Box 3014, Menlo Park, CA 94026

SPECIFICATIONS: All IBM PC, XT, AT, PS/2, PS/1, Tandy, and compatibles with 320K RAM and DOS 2.0 or 384K RAM with DOS 3.0 or higher. All Macs with 512K RAM. IBM and Mac feature sets vary. Investment tracking not available for Mac. CheckFree® electronic payment service not available for Mac or outside the U.S. Unlimited free technical support. Not copy protected.

© Intuit, Inc. 1991

Try
Quicken
risk-free for
60 days at the
special price of
just **\$49.95.** (That's
\$10.00 off!) If you're
not completely satisfied,
simply return it and get
your money back — no
questions asked.



Ad Code: PB04R

Spoil Yourself

With The Best Price/Performance Ratios In The Industry!!!

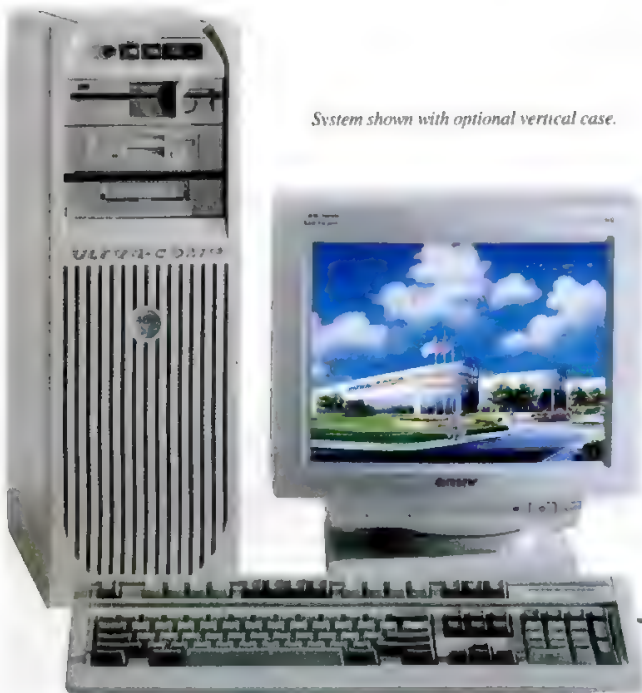
We know *"there is a difference"* between building computers from mediocre, acceptable components and building them from the highest quality components available. You'll see this difference in systems built to last for the long term, not just long enough for the warranty to run out. From monitors designed to reduce the strain on your eyes to hard drives built to last for three times the industry average. We believe the product we sell should be more than just nearly right, it should be exactly right, and it is! Exactly right in every aspect, including the price you'll pay. In fact, you won't find a computer with a better price/performance ratio anywhere. And whether you buy one or one hundred computers from us, we guarantee you'll be happy with Ultra-Comp. If you're not, return your system within 30 days and we'll refund your purchase price. Every system sold on these pages includes one year of On-Site service.

☒ One Year On-Site Service

☒ Toll Free Lifetime Technical Support

☒ 30 Day Money Back Guarantee

☒ Commercial Leasing Available



System shown with optional vertical case.

You Won't Find A More Spectacular Video Anywhere. Ultra-Power systems feature non-interlaced Sony 1304 monitors. The difference between interlacing and non-interlacing is like night and day. Non-interlaced monitors provide a crisp, high resolution image free of flickering and shadow ghosting. We've always known the Sony 1304 is the finest monitor available and now PC Magazine agrees, awarding it the prestigious Editor's Choice award. The Sony 1304 features a .25 dot pitch. It's paired with a 16 Bit VGA card with 1 MB RAM. The image you see will be sharper, brighter and more colorful than those produced by conventional displays.

Outstanding Disk Performance. Superior Maxtor IDE Hard Drives with the fastest access times around. These drives are built to provide exceptional durability, their lifespan is three times the industry average.

All The Memory You'll Need. 4MB, enough to run the most memory hungry software. And a 64K Static RAM Cache on the 486-33, 486-25, 386-33 and 386-25 (\$2,995).

Microsoft Mouse and Windows: a Winning Team. All Ultra-Power systems now include the easy to use Microsoft Windows 3.0 with 630 page manual and software, and the Mouse that outperforms all the others. And your choice of either MS-DOS 3.3 or 4.01.

Teac Floppy Drives. Ultra-Power systems include two Teac floppy drives: both a 5.25" (1.2MB) and a 3.5" (1.44MB). The Teac name is known around the world for quality and dependability.

World Class Keyboard. The Ultra-Click 101 key keyboard, recognized for its superior touch and exceptional on-the-job reliability.

Ultra Warranty with On-Site Service. All Ultra-Power and SX Appeal systems include a one year parts and labor warranty with On-Site service.

"There is a difference"

ULTRA-COMP

ULTRA-MAX 486-33 FISA**\$5695**

- 64K 25NS Static RAM Cache
- 4MB RAM
- 200MB 15MS IDE Hard Drive w/32K Cache
- SONY Trinitron 1024x768 Super VGA Monitor
- 16 Bit VGA Card w/ 1MB RAM
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- Microsoft Mouse & Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports
- One Year On-Site Service

*Lease for as low as \$225 per month****ULTRA-MAX 486-25****\$4295**

- 64K 25NS Static RAM Cache
- 4MB RAM
- 200MB 15MS IDE Hard Drive w/32K Cache
- SONY Trinitron 1024x768 Super VGA Monitor
- 16 Bit VGA Card w/ 1MB RAM
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- Microsoft Mouse & Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports
- One Year On-Site Service
- Upgrade to 33MHz CPU, add \$300

*Lease for as low as \$170 per month****ULTRA-MAX 386-33****\$3495**

- 64K 25NS Static RAM Cache
- 4MB RAM
- 200MB 15MS IDE Hard Drive w/32K Cache
- SONY Trinitron 1024x768 Super VGA Monitor
- 16 Bit VGA Card w/ 1MB RAM
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- Microsoft Mouse & Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports
- One Year On-Site Service

*Lease for as low as \$138 per month****ULTRA 386-25****\$2995**

- 64K 25NS Static RAM Cache
- 4MB RAM
- 130MB 15MS IDE Hard Drive w/64K Cache
- SONY Trinitron 1024x768 Super VGA Monitor
- 16 Bit VGA Card w/ 1MB RAM
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- Microsoft Mouse & Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports
- One Year On-Site Service

*Lease for as low as \$118 per month****ULTRA 386-25****\$2795**

- 4MB RAM
- 80MB 17MS IDE Hard Drive w/32K Cache
- SONY Trinitron 1024x768 Super VGA Monitor
- 16 Bit VGA Card w/ 1MB RAM
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- Microsoft Mouse & Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports
- One Year On-Site Service

*Lease for as low as \$111 per month****ULTRA 386SX-16****\$2195**

- 4MB RAM
- 40MB 17MS IDE Hard Drive w/32K Cache
- SONY Trinitron 1024x768 Super VGA Monitor
- 16 Bit VGA Card w/ 1MB RAM
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- Microsoft Mouse & Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports
- One Year On-Site Service
- Upgrade to 20MHz SX, add \$150

*Lease for as low as \$87 per month**

Call Toll Free

1-800-437-1988

In Missouri Call 314-991-1988



Options. Mini and Baby AT case options available for 386 systems. Upgrade any system to a vertical case for an additional cost of \$150, for Monochrome VGA deduct \$500. If you don't see the particular system configuration you're looking for, call for custom configuration pricing. Other options include hard drives from 40MB all the way up to 1.2 gigabytes, uninterruptible power supplies, tape backups and laser printers. Commercial leasing and extended warranties are also available.

ULTRA-COMP. 11988 Dorsett Road, Maryland Heights, Missouri 63043. Call toll free 1-800-437-1988, in Missouri call 314-991-1988, fax 314-991-0437. MasterCard, VISA, Discover Card, personal and company checks accepted. Minimum order \$25. Customer freight and handling FOB St. Louis, Mo. Non credit card orders shipped UPS COD. Prices and specifications subject to change. Toll free technical support for customers outside of Missouri. Some systems photographed with optional extras. *Commercial lease only, payments based on 36 month open-end lease.

Ultra-Comp is a registered trademark and Ultra-Power and SX Appeal are trademarks of Ultra-Comp. AT is a registered trademark of International Business Machines. Microsoft and MS-DOS are registered trademarks, and Windows is a trademark of Microsoft corporation. 386, 486 and SX are trademarks of Intel Corp. PC Magazine is a registered trademark of Ziff Communications Co. All other trademarks are registered trademarks of their respective owners. Not responsible for errors in typography.

CIRCLE 177 ON READER SERVICE CARD



First Looks

Borland's Heftier C++ Now Does Windows, Too



C compilers grow increasingly complex. Borland C++, a dual C and C++ compiler for both DOS and Windows programs, is very much a part of the trend. The previous version of the compiler, *Turbo C++ Professional* (see First Looks, August 1990), featured an IDE (Integrated Development Environment) that let you edit/compile/debug within a convenient mouse-based multiwindow program, a highly respected debugger, a profiler, and an assembler. Most of these components remain relatively unchanged in the new version.

The new features of the \$495 program are its fine support for Windows programming, DOS extended versions of its major tools, a new feature called precompiled headers, and a new appetite for disk space—15MB in all. Meanwhile, Borland will continue to sell the entry-level Turbo C++ compiler for a reduced price of \$99.

Several of the components, including the IDE and the command line compiler, are now supplied in both traditional and DOS extended versions. Borland claims that the point of the

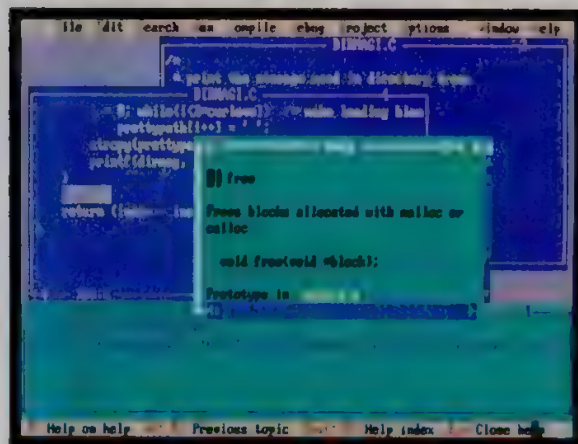
DOS extended versions is capacity—to compile larger source modules by using all of the extended memory on 286 or 386 systems. This may be true for certain programs, but our testing showed that the major advantage of the DOS extended compiler is speed—faster compilation of large modules.

Ironically, while Borland supplies DOS extended versions of its tools, end users cannot create their own DOS extended applications. Currently Borland's only solution for developing applications in the increasingly cramped DOS memory space is VROOM, an automatic overlay system.

One of the frustrations of using a compiled language is that you must recompile an entire module every time you make even the smallest alteration. Borland has reduced this tedium by allowing you to precompile your header (include) files, which are often more voluminous than the actual program text. Once precompiled, the headers can be quickly loaded. Results will vary, but one of my 500-line programs went from an 11-second compile to a 6-second compile when using precompiled headers. And using precompiled headers is a snap.

The biggest news is C++'s support for Windows. Borland's Windows setup includes the modifications to its own software for compiling and linking Windows applications, licensed versions of Microsoft's resource compiler and help compiler, and The Whitewater Group's *Whitewater Resource Toolkit*. Thus, you don't need to buy the \$495 Windows SDK from Microsoft.

It was easy to recompile several existing Windows programs using the Borland system. The only changes that had to be made were to replace the Microsoft C command line compiler options with equivalents for the Borland compiler, and to make



Borland C++'s IDE is now available in a DOS extended version that handles larger files. A comprehensive help facility reduces the need for printed manuals.

one small change to the module definition file. These aspects of using Borland C for Windows programming are clearly explained in the manual. One bonus result was that the fussy Borland compiler complained about several unused variables and other bits of code cruft that had escaped the notice of other compilers. Another bonus is that Borland's export Keyword reduces your maintenance of the module definition file.

Borland has also extended its Turbo Debugger so that it can be used with Windows programs. Turbo Debugger for Windows is an odd beast; it is a true Windows application, but it remains, like its forebears, a full-screen character-mode application. And although these limitations are clearly spelled out in the manual, Turbo Debugger requires Windows to use a standard video mode and does not let you terminate your Windows program by switching to the debugger.

Using Turbo Debugger for Windows is much like using the ordinary DOS version because most of the menus and controls are the same. The Windows-specific features of the debugger allow you to log Windows messages, which is useful both for debugging and for learning how the Windows message-based paradigm works.

Whitewater Resource Toolkit, which is also available separately for \$195 from its manu-

facturer, is a gorgeous, easy-to-use editor for icons, menus, dialog boxes, and other specialized Windows resources. Whereas the C or C++ code in a Windows application specifies what will happen, the resources control the appearance of the program. Being able to manage resources with aplomb is a vital part of Windows development.

Is Borland supplying a complete Windows development system? Well, almost. The major omission is a printed Windows reference. (Retail purchasers get a coupon for a free copy of Charles Petzold's *Programming Windows*; upgrade purchasers get a coupon for a 33 percent discount.) Serious Windows developers will also need *Windows Guide to Programming* (\$29.95) and *Programmer's Reference* (\$39.95), both from Microsoft Press. Programmers interested in using C++'s object-oriented technology for Windows may be disappointed that Borland doesn't supply a C++ class library for Windows.

The greatly increased price of Borland C++ states that this is for professionals; its strong support for Windows programming reinforces the message. The strong points of the product are its excellent programming environment and debugger, and the supplied assembler and profiler. Weak points are poor support for the OS/2 and DOS extended environments, and the lack of an optimizer. ■



FACT FILE

Borland C++ 2.0

Borland International, Scotts Valley, CA 95066; 408-438-5300.

List Price: \$495; upgrade from Turbo C or Turbo C++, \$149; upgrade from Turbo C++ Professional, \$99.

Requires: 286 processor or better, 640K of memory, 5MB to 7MB hard disk space. Extended memory and mouse recommended.

In Short: A complete C and C++ development system for DOS or Windows.

CIRCLE 706 ON READER SERVICE CARD

11

After 20 Million Pages Of PostScript Color Output, The Last One Looks As Great As The First.



QMS ColorScript Printers... Brilliant and Resilient

Since 1987, QMS ColorScript™ 100 printers have produced over 20 Million hard copies and transparencies around the world! And because this color technology is engineered to use new ink with each print, the last page literally looks as bright and true as the first. This reliable QMS® technology has been united with the industry standards of Adobe® PostScript® and PANTONE® Color to put exciting, persuasive color at your fingertips page after page.

Presenting The ColorScript Model 10 Printer

If it's dynamic presentations you're after, you need the Model 10. From business presentations to training programs, the Model 10 delivers vibrant, visually exciting colors that help you communicate ideas clearly. QMS screen angling technology and special presentation inks make these unusually captivating colors possible. And it's a proven fact that color presentations increase audience information retention and raise a

recipient's tendency to act upon the information. So, in today's competitive business environment, the key question becomes, "Can we afford *not* to have the power of color?"

The ColorScript Model 30i Printer, Strictly For The Image Conscious

Extremely low cost Pantone-approved proofs in about 60 seconds. If you're a graphic designer, commercial artist or publisher it's easy to see how the Model 30i is revolutionizing your business. The QMS ColorScript 100 Model 30i is changing the relationship between speed, quality and cost by allowing you to do your job faster, cheaper *and* better!

The Model 30i is the first true "what-you-see-is-what-you-get" color printer. The colors you see on a Pantone-approved monitor are the same colors you'll see on a Model 30i proof *and* the same colors you'll see on the finished, printed piece. And the standard 11" x 17"/A3 paper handling capacity allows you to design actual size 8 1/2" x 11" full bleed proofs with crop marks.

True Adobe PostScript Guarantees Compatibility

Since Adobe introduced the PostScript page description language in 1984, it's become the industry standard for electronic printing and publishing. And

Features That Will Color Your Perception Of Business And Design Forever

- Compatible with Macintosh computers, IBM PC's and clones and other popular systems
- 35 resident Adobe PostScript typefaces all scalable and rotatable
- Model 30i has standard 8 MB RAM/1 MB ROM
- Model 10 has standard 5 MB RAM expandable to 8 MB RAM
- Model 10 prints letter- and legal-size paper and transparencies
- Model 30i prints letter-size and 11" x 17" paper and transparencies
- AppleTalk®/RS-422, RS-232 serial and Centronics® parallel interfaces provide compatibility with most micro, mini, mainframe and workstation hosts
- External SCSI interface supports up to seven additional hard drives of unlimited size
- 68020 MPU-based controller plus exclusive QMS ASAP™ technology means fast first-page-out performance
- Prints high-quality Adobe PostScript text and graphics at 300 x 300 dots per inch
- HP-GL® emulation software included

with the QMS ColorScript 100 Model 10 and Model 30i, you get guaranteed compatibility and consistency. PostScript imitations, on the other hand, may not be 100 percent compatible with Adobe's PostScript.

Two Top Performers Right Out Of The Box

Whether you choose the Model 10 or the Model 30i you can be up and running within minutes. Both printers are designed for maximum compatibility with Macintosh® computers, IBM® PC's and compatibles as well as many other systems. And, for additional support, QMS's technical and service professionals are standing by to assist you with answers that will get you up to speed fast. Call us today and we'll help you decide which printer best suits your needs. Or FAX QMS Product Information at (205) 633-4866.

1-800-523-2696 EXT. 33

QMS 
Where Imagination Leads

*PANTONE® is Pantone, Inc.'s check-standard trademark for color reproduction and color reproduction materials.
PANTONE Colors generated by QMS PostScript printers are four-color simulations and may not match PANTONE-identified solid color standards. Use current PANTONE Color Reference Manual for accurate color.
The following are trademarks or registered trademarks of their respective companies: QMS, QMS ColorScript, ASAP, and the QMS logo of QMS, Inc. Adobe and PostScript of Adobe Systems, Inc. IBM of International Business Machines Corp. AppleTalk and Macintosh of Apple Computer, Inc. HP-GL of Hewlett-Packard Company. Centronics of Centronics Data Computer Corp.

First Looks

Superlatives: Optimizer for Generic Spreadsheets

HANDS ON
by Craig Stinson

The newest comer in the burgeoning field of spreadsheet optimizers is *Superlatives*, a \$295 utility from Graphicus. Like *Microsoft Excel 3.0*'s solver add-in, *Lotus 1-2-3/G*'s built-in solver, and *What-If Solver for 1-2-3*, *Superlatives* performs both linear and nonlinear constrained optimization problems using information supplied in spreadsheet models.

Unlike its competition, *Superlatives* is a standalone program run from the DOS prompt. It divides its screen into three windows: for the model itself, input, and output. You load your .WK1 or .WKS file into the model window and declare goals and constraints in the input window.

Problems are tackled iteratively; *Superlatives* keeps solving until a preset number of iterations have been run or until changes in the target value fall

below a user-configurable threshold. The output window displays the results of all iterations. A simple command transfers any solution from the output window back to the model window, where it can be re-saved to spreadsheet format.

Since *Superlatives* operates as an add-on, rather than an add-in, it can be used with any spreadsheet program that can read and write .WK1 files. This also makes it less accessible than built-in solvers. Having to quit the spreadsheet program to run the optimizer is awkward, but *Superlatives* compounds the inconvenience by making you redefine your problem in the program's input window.

Moreover, each of the program's three windows has its own separate menu, and most commands can be executed only from particular windows. Familiar spreadsheet moves, such as pressing an arrow key to enter a value and move to an adjacent cell, work in some contexts but not others. Finally, the three

windows are of fixed size and position, making for a very cramped display.

To its credit, *Superlatives* makes effective use of color. It also offers useful graphics displays, including an "influence" chart that shows which adjustables have the most and least effect on a problem. It also includes a "random run" that tests each adjustable cell in your model with a spectrum of random values, helping you determine whether the result of an optimizing run is a "local" or a "global" optimum. Unfortunately, printed output is limited.

Superlatives is good news for those who need to optimize .WK1 files created outside of *Lotus 1-2-3*. But it's weak competition for *What-If Solver* and the *1-2-3/G Solver*.

List Price: *Superlatives*, \$295. **Requires:** 512K (640K for large models), DOS 2.0 or later. Graphicus, 150 Lake St. South, Kirkland, WA 98033; 206-828-4691.

CIRCLE 708 ON READER SERVICE CARD

AutoShade Adds Photorealistic Imaging to its Repertoire

HANDS ON
by Jeff Proctor

Until now, *AutoShade*, *AutoCAD*'s companion rendering program, was limited to producing simple shaded renderings. Now Version 2.0 incorporates Autodesk's own implementation of Pixar's *PhotoRealistic RenderMan*, bringing photorealistic imaging power to the hands of *AutoCAD* users.

The seamlessly integrated *RenderMan* component of *AutoShade* uses prepackaged

routines called "shaders" to compute how surfaces should look. Surface shaders let you assign material finishes to a model. Displacement shaders allow you, for example, to knurl the end of a cylinder or depict screw threads. Light shaders control the type, direction, and intensity of the light applied to the scene, while atmosphere shaders simulate the effects of atmospheric elements such as fog on light reaching the eye.

AutoShade 2.0 can achieve sophisticated effects even with-

out *RenderMan*. An impressive smooth-shading option allows you to blend colors on adjoining facets of polymesh surfaces to produce the illusion of continuity. You can also cast light on the scene and set the position and intensity of the light sources (*RenderMan* goes further by allowing you to add spotlights and compute shadows). *AutoShade* also lets you control the reflectivity of surfaces on an object. And perspective can be turned on so that objects will appear to vanish into the distance. Autodesk has announced that a version of *AutoShade 2.0* without *RenderMan* will soon be available; it will run on 8086- and 286-based machines with an expected retail price of \$500 (upgrades, \$100).

Whether you plan to shade or render an *AutoCAD* object, you begin by creating the basic geometry in *AutoCAD*. Then, still in *AutoCAD*, you assign it qualities such as finishes and textures, position lights and cameras, and generate a filmroll file (.FLM) for export to *AutoShade*. Once inside *AutoShade*, you can either shade the .FLM

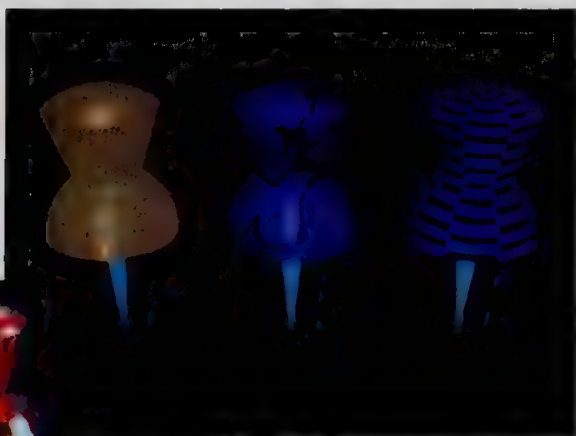
scenes or create a *RenderMan* Interface Bytestream (RIB) file for rendering. *RenderMan* is invoked from *AutoShade*'s pull-down menu. You can save files to a disk in a choice of file formats, including EPS and TIFF.

AutoShade includes *AutoFlix*, which lets you create animated interactive presentations using *AutoShade* renderings or *AutoCAD* slide (.SLD) files.

As is the norm for Autodesk products, *AutoShade*'s documentation is superb—a deserving touch for a product that is as well executed as it is powerful and fun to use.

List Price: *AutoShade*, Version 2.0 with Autodesk *RenderMan*, \$1,000; upgrade from earlier versions, \$500. **Requires:** 386 or 486 microprocessor (386 must be step B0 or better), 4MB RAM (6MB recommended), 20MB free hard disk space, math coprocessor (387 or Weitek 1167/3167/4167), VGA or Targa board, DOS 3.3 or later. Mouse or digitizer recommended. Autodesk Inc., 2320 Marinship Way, Sausalito, CA 94965; 415-332-2344.

CIRCLE 436 ON READER SERVICE CARD



AutoShade renders photorealistic images using *RenderMan*. Previous versions were limited to conventional shaded rendering (inset).



Our Latest PostScript Printer Technology Impressed The Experts...



MacUser,
Editor's Choice Award
(Eddy), Jan. 9, 1991



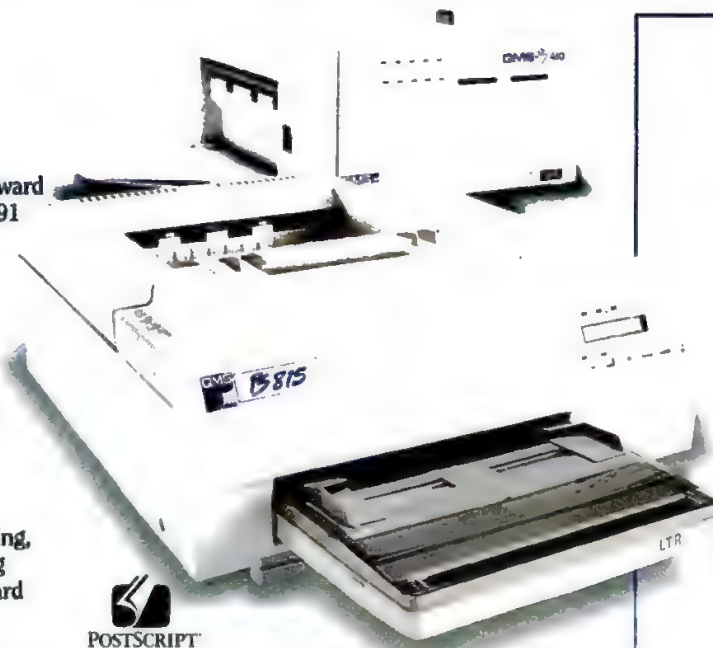
PC/Computing,
Most Valuable
Product,
Nov. 1990



BYTE,
Editor's Product
Merit Award,
Jan. 1991



Personal Publishing,
1990 Outstanding
Achievement Award



QMS-PS 410, 815 & 825 PostScript Laser Printers

- ESP - Emulation Sensing Processor (printer interprets incoming printer language and switches automatically)
- SIO-Simultaneous Interface Operation (allows the printer to receive data from three interfaces simultaneously)
- LocalTalk, RS-232C serial and Centronics parallel interfaces (connects to IBM® PC's, Apple® Macintosh® computers and most mini computers and mainframes)
- 45 resident Adobe PostScript typefaces (all can be scaled from 4 points upward, rotatable, all with multilingual character sets)
- Front Panel Display on QMS-PS 815 & 825 (16-digit multilingual LCD array conveys printer status, allows user to quickly configure printer)
- Resident HP LaserJet Series IIP & PostScript emulations (prints PostScript & HP applications, HP-GL emulation cards available)
- QMS ASAP III Technology and 68020 Microprocessor (exclusive technology means fast first-page-out performance)
- PS Executive Series™ Utilities Software (to easily set printer parameters)

...So We Decided To Give Them More Of A Good Thing.

Before we developed the QMS-PS® 410 four page-per-minute laser printer, we performed one very important task. We listened to what you wanted. Then we engineered a printer light years ahead of the rest with features that aren't available on other printers at any price.

And now, QMS brings you more of a good thing. The QMS-PS 815 and 825. Two eight page-per-minute laser printers with all the leading edge features of the 410 *plus* enhanced processing speed, an increased duty cycle and an easy-to-read, multilingual front panel that lets you quickly configure the printer to suit your specific needs.

Award-Winning Simplicity

How did these printers capture the imagination of an entire industry? The answer is, quite literally, simple! These leading edge printers are so simple to operate they seem to "think for you." Each printer features ESP® (Emulation Sensing Processor) which allows them to interpret incoming data and automatically choose the appropriate printer language without changing switch settings or sending complicated software commands. And to make things still simpler, the 410, 815

and 825 can receive data simultaneously to LocalTalk®, RS-232C serial and Centronics® parallel interfaces, which makes them the best on the market for mixed computer environments. All this and more is the result of QMS's exclusive ASAP™ III technology (Third Generation Advanced System Architecture for PostScript). And it's this proprietary QMS® technology that wins awards *and* customers.

True Adobe PostScript Plus HP Emulations

Whether you choose the 410, 815 or 825, you'll enjoy the desktop design flexibility of the latest version of Adobe® PostScript®. This most recent version includes the output enhancement of Adobe Type Manager™ (ATM). All printers come standard with 45 resident typefaces scalable from 4 points upward and fully rotatable. These PostScript printers guarantee compatibility with thousands of useful PostScript applications currently on the market.

For even greater flexibility, these printers feature standard HP® LaserJet® Series II emulation to support non-PostScript printing applications. And a variety of options makes the printers easily expandable. HP-GL®

emulation cards, HP compatible font cards, memory upgrades and extended paper handling capabilities are all currently available.

Expert Service And Support

As a recognized leader in PostScript printer technology, QMS maintains a commitment to customer satisfaction by providing free, responsive technical support. And to keep your QMS printer operating at its peak, QMS National Service offers a variety of service options. Call us today and see how QMS quite simply makes the best PostScript laser printers in the world. Or FAX QMS Product Information at (205) 633-4866.

1-800-523-2696 EXT. 31



The following are trademarks or registered trademarks of their respective companies: QMS, QMS-PS, ASAP, PS Executive Series and the QMS logo of QMS, Inc.; Adobe, PostScript, Adobe Type Manager and the PostScript logo of Adobe Systems, Inc.; Apple, Macintosh and LocalTalk of Apple Computer, Inc.; HP, LaserJet and HP-GL of Hewlett-Packard Company; Centronics of Centronics Data Computer Corp.; IBM of International Business Machines, Inc.
*patent pending

CIRCLE 164 ON READER SERVICE CARD

First Looks

The Unmouse: A More Versatile Mousetrap

HANDS ON
by John R. Gower

Despite what your mother told you about it being impolite, PC users need to point. The Unmouse, from MicroTouch Systems, is the quintessential pointing device; you can point using your finger, a normal pen, or the supplied stylus. Moreover, it's incredibly versatile.

In its mouse mode, the \$235 Unmouse faithfully mimics a traditional mouse; in its absolute mode, the unit acts like a digitizing tablet; and in its trackball mode, it employs ballistic tracking. You can even use it as a function keypad. It comes replete with function-key application templates, and you can program function-key macros via its power-key option.

The device is a flat surface covered by a 3- by 4-inch coated glass plate. Relying on a volt-

age-field linearizing technology, The Unmouse is touch-sensitive. All you need to do is slide your finger (or anything that conducts electrical current) across its surface to move the cursor. Each time you use pressure on the glass surface, a microswitch underneath the plate is activated, imitating the click action of a mouse.



MicroTouch Systems' Unmouse is a mouse, digitizer, and trackball rolled into one.

The transparent glass tablet has a resolution of 1,024 by 1,024 touch points—330 by 220 points per inch. The included Unmouse driver directly supports DOS 2.0 or later and Windows 3.0, but any application with support for a Microsoft Mouse driver will also recognize the device, since MicroTouch includes its own Microsoft Mouse emulation driver. Also included is a special software control panel to make adjustments for recalibration, friction, and sensitivity.

Of the three modes that The Unmouse offers, the digitizing tablet's absolute mode provided

the most pleasing performance. It gives you pinpoint cursor control for drawing. It also lets you insert hard-copy drawings underneath the unit's glass plate for tracing. A button on The Unmouse's side lets you click without lifting your stylus. In mouse mode you can drag objects with a button lock, and the trackball mode approximates the motion of a spinning ball.

You'll have to relinquish a COM port to install the device, since no bus version is available. Power is supplied by a jump connector that splits power from your keyboard. If your system won't handle the drain, MicroTouch will supply a power adapter.

Inveterate mice users will find it difficult to give up familiar habits, but those who have shunned mice, or have never used a pointing device, will probably become Unmouse aficionados in no time.

List Price: The Unmouse, \$235. **Requires:** 512K RAM, DOS 2.0 or later. MicroTouch Systems Inc., 55 Jospin Rd., Wilmington, MA 01887; 800-866-6873, 503-694-9900.

CIRCLE 703 ON READER SERVICE CARD

Xircom's Multiplexor Magic Turns One Parallel Port into Two

HANDS ON
by Alfred Poor

The Parallel Port Multiplexor is clearly a response to our times. Today, people are using laptops and notebooks that lack adequate expansion card slots, but they're looking for ways to hook these laptops up to multiple printers, local area net-



works, and disk drives, all at the same time. Xircom's \$95 Parallel Port Multiplexor works modern-day alchemy by transforming a single parallel port into two ports.

The Multiplexor is a 3- by 2.3- by 1.4-inch plug-and-play device. A small driver that comes in both .SYS and executable .COM forms makes it particularly easy to install. The software's default settings designate the bottom connector as LPT1 and the top connector as LPT2. The top connector also recognizes interrupt 7 by default, which is required by some devices such as pocket LAN adapters.

If you need different settings, you can load the driver software with a variety of configuration options. One option that is missing, however, is an "unload" switch. Currently, the only way to remove the driv-

er is to reboot your computer.

If you already have two parallel ports, the Parallel Port Multiplexor gives you a third one. You can attach it to either LPT1 or LPT2 and configure it to give you any combination of two logical ports: LPT1, LPT2, and LPT3.

Xircom created this device as an adjunct to its pocket LAN adapters, but users have given it a life of its own, finding it useful for connecting two printers, or other combinations of parallel devices. The Multiplexor comes with an 8-inch extender cable, making physical connections easier.

We tested the unit with a variety of different applications; none caused the Multiplexor to malfunction. We ran a range of DOS applications, including some spreadsheet programs, as well as Windows 3.0, and were able to work with either LPT1 or LPT2 on both a Toshiba notebook computer and a typical desktop computer.

The only products that are going to give the Multiplexor problems are those that write directly to the hardware, bypassing BIOS and DOS calls. *Fast-Lynx*, the file-transfer program from Rupp Technology, apparently does just this; it failed to operate correctly using a parallel connection. Since file-transfer programs and the Multiplexor are both integral parts of laptop life, Xircom is working closely with Traveling Software to come up with a version of *LapLink* that will work with the Multiplexor.

At \$95, the Xircom Parallel Port Multiplexor is a treasure. If you've been stymied by the lack of a second parallel port on your laptop, this could be the answer to your problem.

List Price: Xircom Parallel Port Multiplexor, \$95. **Requires:** A standard parallel port. Xircom Inc., 26025 Mureau Rd., Calabasas, CA 91302; 800-874-7875, 818-884-8755.

CIRCLE 704 ON READER SERVICE CARD

The 11" x 17" PostScript Powerhouse

Just \$9995!



Features That Make The QMS-PS 2210 A True PostScript Powerhouse!

- Up to 11"x17" printing capability
- 22 pages per minute and QMS ASAP technology cuts waiting time
- 4 MB RAM builds complex pages quickly
- 39 resident Adobe PostScript typefaces
- HP LaserJet & HP-GL emulations for non-PostScript applications
- AppleTalk, RS-232 serial and Centronics parallel interfaces mean instant connectivity in practically all environments
- Choice of 350 or 600 sheet input capacity
- SCSI port allows connection of up to seven external hard drives for font caching and permanent storage of downloadable typefaces, emulations and PostScript programs
- PS Executive Series™ utility software allows each user to name, configure and align the printer as well as download fonts from the individual host computer

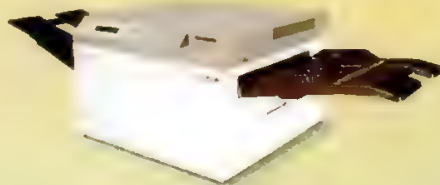
22 Pages Per Minute Give It The Best Price-To-Performance Ratio On The Market

It took QMS® to engineer a 22 page-per-minute PostScript® laser printer that stretches beyond the capabilities of other printers and *still costs less!* The QMS-PS® 2210 reaches beyond many others by giving you all popular paper sizes up to 11" x 17"/A3-size printing capability. And it surpasses others in print quality as well with laser-sharp fine line detail and rich saturated black fill areas. No more pale cut-and-paste newsletters, no more mismatched spread sheets, no more engineering and design projects held together with staples and tape! And the 2210 beats the competition price-wise, too, by delivering all this and more for just \$9995.

Perfect For The "Upscale" Network

The QMS-PS 2210 is perfect for a shared printer environment requiring high-quality 11"x17" output. Whether you use Macintosh® computers,

IBM®PC's /compatibles or most other mini computers and mainframes, you'll enjoy instant connectivity with AppleTalk®, RS-232 serial and Centronics® parallel interfaces. Should you require non-PostScript printing applications, the 2210 comes standard



with HP-GL® and HP® LaserJet® emulations. The 2210 also cuts waiting time with fast page processing made possible by QMS's exclusive ASAP™ (Advanced System Architecture for PostScript) technology and a 68020 microprocessor. That means fast first-

CIRCLE 141 ON READER SERVICE CARD

page-out performance. Add this to 350 sheet input capacity (600 sheets in the QMS-PS 2220) plus a 20,000 page-per-month duty cycle, and it's easy to see why the QMS-PS 2210 is a true network star!

Expert Service And Support

As a recognized leader in PostScript printer technology, QMS maintains a commitment to customer satisfaction by providing free, responsive technical support. And to keep your QMS printer operating at its peak, QMS National Service offers a variety of service options. Call us today and see how easy it is to put the true PostScript powerhouse to work for you. Or FAX QMS Product Information at (205) 633-4866.

1-800-523-2696 EXT. 32

QMS
Where Imagination Leads

The following are trademarks or registered trademarks of their respective companies: QMS, QMS-PS, PS Executive Series, ASAP, and the QMS logo of QMS, Inc. PostScript of Adobe Systems, Inc. IBM of International Business Machines Corp. AppleTalk and Macintosh of Apple Computer, Inc. HP, LaserJet, and HP-GL of Hewlett-Packard Company. Centronics of Centronics Data Computer Corp.

First Looks

\$499 Seikosha LT-20: 24-Pin Portable Printing

HANDS ON
by Matthew J. Rose

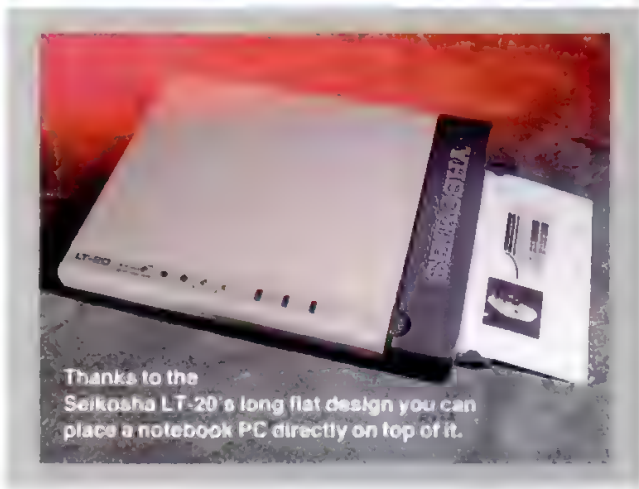
The latest entry into the burgeoning portable printer category is the \$499 Seikosha LT-20, a 24-pin dot matrix unit that's designed to rest under your laptop as you work, and slip alongside it as you travel.

The LT-20 distinguishes itself from other portable printers in its paper handling. An interior 50-sheet tray keeps paper clean and wrinkle free on the road. Manual feeding is easy.

However, the design creates some size penalties. The LT-20 measures 2.1 by 14.5 by 11.25 inches—enough to stretch the seams of any briefcase. Weight is not a problem; the LT-20 weighs 6.6 pounds with its AC adapter installed, and just over 7 pounds with a full paper tray.

With its sub-\$500 price, the LT-20's chief competition is the

Canon BJ-10, which is smaller and about 2 pounds lighter. Canon's ink jet technology is also far quieter than the LT-20's 24-pin dot matrix print head. But the LT-20's built-in paper tray is clearly superior to the Canon's paper handling.



Thanks to the Seikosha LT-20's long flat design you can place a notebook PC directly on top of it.

The LT-20's battery options and its three-part form handling also give it an edge. The battery options were unavailable for this review, but, for \$50, a 12 AA battery pack (batteries not included) frees the printer from AC power. Seikosha will also offer a nickel cadmium pack and a choice of two battery chargers: a \$46.99 external charger, or a \$121.99 trickle charger that lets you print while charging the batteries.

The output quality of the LT-20 is on par with the BJ-10. In

its IBM Proprinter emulation, the LT-20 features 10- and 12-character-per-inch letter quality Courier and proportional type, as well as draft and SSD—15-cpi superspeed draft. LQ output is quite good. The LT-20 printed 25.7 characters per second on the PC Magazine Labs printer benchmark test; 54 cps on the SSD setting—reasonable speeds. It scored 0.6 graphic pages per minute on our tests, but in spite of its 360 by 180 graphics resolution, the LT-20 is not the printer you should be using for serious graphics work.

Optional battery-powered printing, reasonable weight, and good paper handling make the Seikosha LT-20 a wise choice for the road. ■

List Price: Seikosha LT-20, \$499; with AA battery support, \$549; nickel cadmium AA battery pack, \$77.99; external battery charger, \$46.99; combination AC power pack/battery charger, \$121.99; cigarette adapter, \$99.99; nylon carrying case, \$74.99. Seikosha America Inc., 10 Industrial Ave., Mahwah, NJ 07430; 800-338-2609, 201-327-7227.

CIRCLE 710 ON READER SERVICE CARD

PC-File Gains Ready-to-Go Apps and Viewer

HANDS ON
by Richard Hale Shaw

DBMS (database management software) vendors readily supply database tools to developers, but seldom attempt to meet the end users' needs. Buttonware, makers of *PC-File*, bucks the trend with two new tools for end users: *PC-File Ready-To-Run Applications*, a set of ready-made database applications, and *dB Crayons*, a pop-up database viewer. The applications are a terrific value; the viewer is helpful, yet limited.

At \$24.95 each, the ready-to-run applications include 14 databases. The business applications include: accounts payable, pre-pay and purchase order invoicing, business contacts, personnel, and church record keeping. The home applications include an address

book, checkbook, and inventory databases for tracking collections, as well as household items.

Each application consists of a database with sample records, predesigned mail-merge letters, report forms, and mailing labels. It's easy to see that the databases were created to accommodate the end user. For instance, the music database, designed to track albums, CDs, and tapes, will let you record the title, artist, or group, recording label, and producers; the accounts payable database can be used to write checks and record bookkeeping transactions.

Reports vary with each application. The personnel application, for instance, prints payroll information by employee or pay period; the business contacts database can print 3 by 5 and Rolodex cards, phone lists,

schedules, and mailing labels; the invoicing applications can print supplier lists and invoices.

Each application takes full advantage of *PC-File*'s reporting language and preprogrammed smart keys. Each offers on-disk documentation and is fully customizable.

dB Crayons is a \$59.95 TSR that lets you hotkey into a *PC-File* database. *dB Crayons* lets you search for and display records, print envelopes, labels, or reports, and cut-and-paste data from records on-screen into an underlying application or program. *dB Crayons* will also dial phone numbers from database fields. Its Setup program lets you reassign the activation key, change screen colors, set the default startup directory and filename, and utilize expanded memory or disk swapping.

dB Crayons can also be run in nonresident mode, a handy feature since the program doesn't cooperate very well with other resident programs.

You don't have to load *PC-File* to use *dB Crayons*, but it reads only *PC-File* databases and will not let you update database files—only view them. The interface also has too many menus. TSR System's popular *DataFinder*'s preferable approach puts you more directly into more types of data and lets you update the files as well.

PC-File users will find both of these tools helpful. The ready-made applications are a steal, and with *dB Crayons*, you can get at your database from anywhere—and at anytime. ■

List Price: *PC-File Ready-To-Run Applications*, \$24.95 each. *dB Crayons*, \$59.95. **Requires:** *dB Crayons* requires 188K available RAM (only 18K if expanded memory is available). Both programs require either: *PC-File:db*, *PC-File+*, *PC-File/R*, or *PC-File III*, Version 3.0 or Version 4.0. Buttonware Inc., P.O. Box 96058, Bellevue, WA 98009-4469; 800-528-8866.

CIRCLE 428 ON READER SERVICE CARD

You Find The Best Values In The Most Unusual Places...

North Sioux City, South Dakota, for example. This little town probably doesn't come to mind when you think of shopping for a personal computer. And yet the best values in the PC industry come from North Sioux City, home of Gateway 2000.

Gateway 2000 has roots firmly planted in this part of the country. When buffalo still roamed the great plains, George Waitt founded the Waitt family cattle business in the frontier town of Sioux City, Iowa. Family legend says he started his herd by saving cattle that jumped off barges into the Missouri River.

Over a century later, George's great, great grandson, Ted Waitt, founded Gateway 2000 in the same tradition. Gateway was started by rescuing PC users who were stranded in a marketplace without a source of quality, affordable computers.

Today, Gateway 2000 continues the tradition of providing the best value in the industry, based on old-fashioned Midwestern values.



Value In The Industry – And It All



Product Testing: "I
user before it goes
If anything looks
tionable, we fix it
immediately."

Assembly Technician:
g a computer, I try
ere my machine is
m building it for."



We Value Quality

Being frugal doesn't mean skimping on quality. Only the highest quality components from the most quality-conscious suppliers go into a Gateway 2000 computer. Midwestern pride in workmanship and quality is demonstrated by every one of nearly 100 skilled assembly technicians. These technicians build your complete system one at a time.

"Total Quality Management" is Gateway's commitment to quality. TQM is a progressive quality philosophy developed by W. Edwards Demming, a native of Sioux City, Iowa. TQM is widely used to increase quality and productivity. Its use throughout Gateway 2000 has allowed the company to continually improve operations – even while the firm is growing at a phenomenal rate. To provide the best value in the industry, Gateway 2000 must value quality.



Jerry Mayer, Vice President,
Operations: "TQM consists of
continuous process improvement
activities involving everyone in
the company, managers and
workers, to improve value and
customer satisfaction at
every level."

We Value Strength

A company's strength is measured by its balance sheet. As independent sources will confirm, Gateway 2000 has an enviable balance sheet coupled with strong growth. Inc. Magazine listed Gateway as the second fastest-growing private company in America during 1990. Financial strength is crucial to you. What good are warranties, guarantees or promises of lifetime technical support if the company that sold you the computer goes out of business? To provide the best value in the industry, Gateway 2000 must be strong.

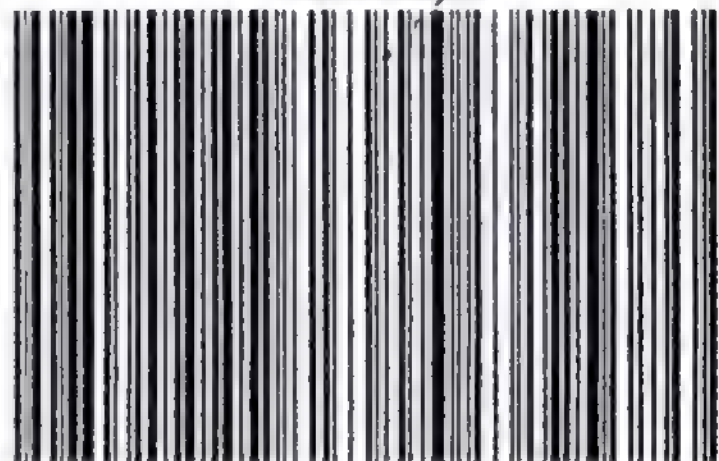


Although Otis, Rock, Luther and Chili Dog are evidence that Gateway has plenty of brute strength, the company's real strength is in a robust balance sheet and healthy growth. Otis is our nickname for John Staley; Rock is Mike Hingst; Luther is Brent Culbertson; and Chili Dog is Brent VanderWeil.

1. Follow instructions on the other side

Back

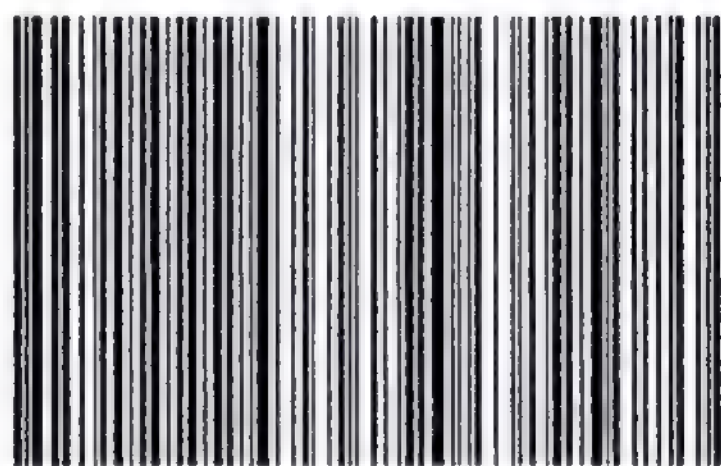
GBSSlipBack-001B



Inverted Back

1. Follow instructions on the other side

Folded edge of the page

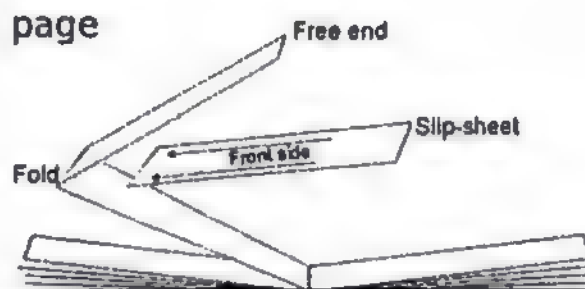
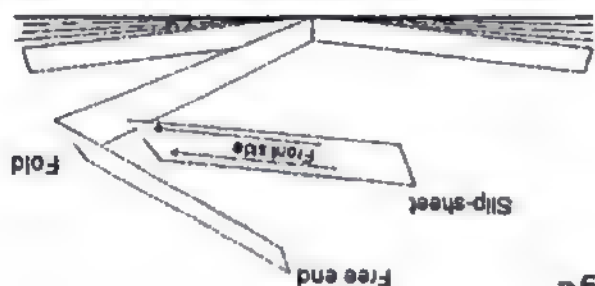


GbsSlipSheet-001

Inverted Foldout slip-sheet

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
1. Front side touching the free page
2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

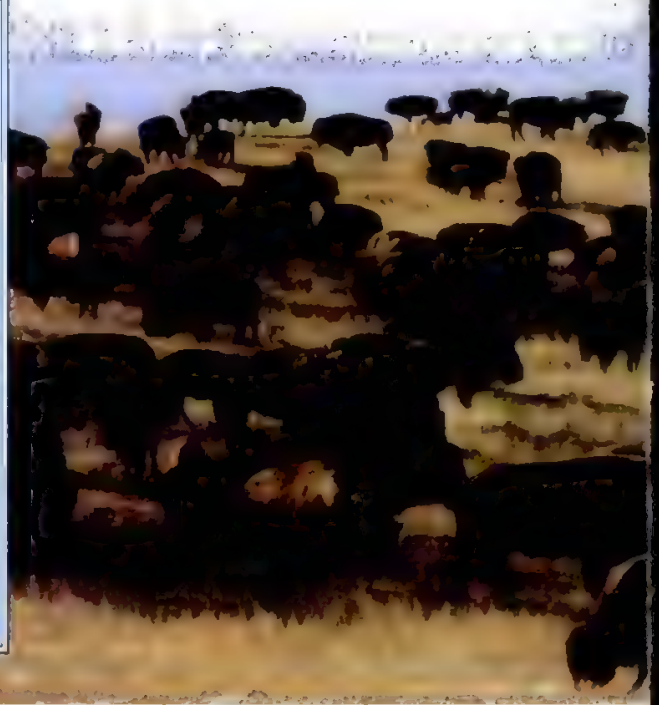


That's The Best

"Whenever I'm asked," continued Ted Waitt, "why Gateway 2000 is so successful, my answer is: value. When you buy a Gateway 2000 computer, you're getting the best price, best quality and features, best service, all from a very strong, healthy company. That's value."

"Then I'm asked how we provide value," Ted remarked, "and the answer is almost the same. It's values. The values of the people at Gateway 2000 give our product its value," he said.

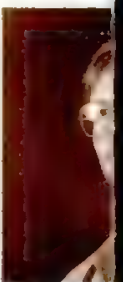
"People who grow up in the Midwest are inevitably shaped by the values of a culture that is one way or another dependent on the earth," he explained. "And when you depend on the earth for your living, you learn to value frugality, quality, resourcefulness, hard work, strength, and most of all, integrity and honesty in all of your dealings with other people. Providing value in our products starts with these values."



Earle Grueskin, Facilities Manager: "Our plant is a functional, no-frills, 70,000 square-foot metal building with a gravel parking lot. Someday we might pave the parking lot. Then again, we're getting along OK with the gravel."

We Value Frugality

Being frugal is the opposite of being wasteful. At Gateway 2000, the company doesn't waste time or money. For example, when a new plant was constructed in 1989, the company didn't waste money on showy, chrome-and-glass corporate offices. The new facility houses an efficient factory and functional offices. Although the company that sells more systems through the direct market channel than any other PC manufacturer in the nation can certainly afford luxurious offices, that wouldn't be frugal – and to provide the best value in the industry, Gateway 2000 must be frugal.



Barry Beldin, Production Manager: "We test each computer before it goes to shipping queue."

Ken Gardner, Assistant Manager: "When I'm building a picture, who's going, who's not?"



...Like South Dakota, Where Saved \$10,747,

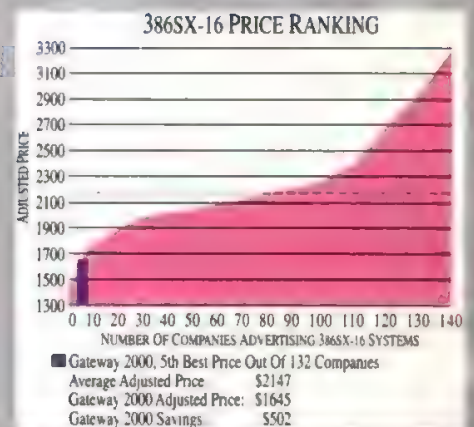
"We asked an independent research firm to do a study for us," said Ted Waitt, Gateway 2000 President. "I wanted to see an unbiased, direct comparison of features and prices from the manufacturers who advertise in the Computer Shopper. The results were astonishing," he exclaimed, "even to me. Ranked by best price, Gateway 2000 was the only major direct marketer at the top of the lists. The other 'big guys' in the direct market field were so far down in the rankings I couldn't even find some of them. Get a copy of the study and see for yourself."*



"This study proves what we've been saying all along. Gateway 2000 clearly offers the best value in the computer industry." Ted Waitt, Gateway 2000 President

Computer buyers who purchased Gateway 2000 systems in January saved an average of \$697 per system. This figure comes from a comparison of 132 computer manufacturers' advertised prices in the January 1991 issue of Computer Shopper – the nation's most comprehensive source of direct market computer products.

That means Gateway customers shared a total savings of \$10,747,179 on 15,427 systems in one month alone. Call for your free copy of the study, which includes details of how the information was prepared, and compare for yourself. This kind of value is worth investigating.

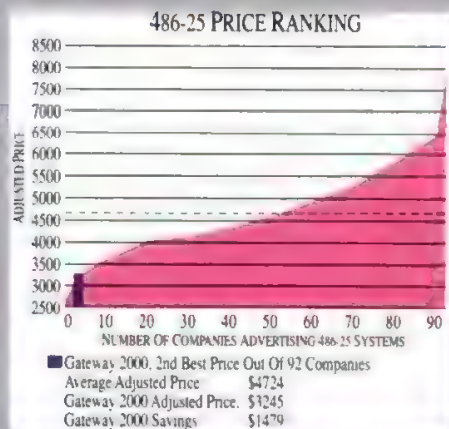


Gateway 2000 Customers 179 In One Month.



The Badlands of South Dakota are a moonscape on earth.

Prices in the 386SX-16 study were adjusted to reflect a system configuration including 4 MB RAM, 1.2 MB 5.25" Disk Drive, 1.44 MB 3.5" Disk Drive, 40 MB Hard Drive, 16 Bit VGA with 512K, Color SVGA Monitor, Keyboard, DOS, 1-year warranty and 30-day guarantee.



Prices in the 486-25 study were adjusted to reflect a system configuration including 64K Cache RAM, 8 MB RAM, 1.2 MB 5.25" Disk Drive, 1.44 MB 3.5" Disk Drive, 100 MB Hard Drive, 16 Bit VGA with 512K, Color SVGA Monitor, Keyboard, DOS, 1-year warranty and 30-day guarantee.

**Call 800-523-2000 and talk to a sales representative for further information about this study.*

Gateway 2000 Systems

12MHz 286VGA

- 80286-12 Processor
- 1 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16 Bit VGA with 512K
- 14" Gateway Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01

\$1495.00



GATEWAY 386SX

- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16 Bit VGA with 512K
- 14" Gateway Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

\$1895.00



25MHz 386 VGA

- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 80 MB 17ms IDE Drive with 32K Cache
- 16 Bit VGA with 1 MB
- 14" Gateway Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

\$2395.00

25MHz 386CACHE

- 64K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 80 MB 17ms IDE Drive with 32K Cache
- 16 Bit VGA with 1 MB
- 14" Gateway Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

\$2695.00



33MHz 386VGA

- 64K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Multi-Segmented Cache
- 16 Bit VGA with 1 MB
- 14" Gateway Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

\$3195.00



25MHz 486 VGA

- 64K Cache RAM
- 8 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Multi-Segmented Cache
- 16 Bit VGA with 1 MB
- 14" Gateway Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

\$3995.00



33MHz 486VGA

- Same configuration as the 25 MHz 486.

\$4395.00

BEST BUY

- Same features as our 33 MHz 386 VGA system except this machine has an 80 MB 17ms IDE Drive instead of the 200 MB 15ms IDE Drive.

\$2795.00

STANDARD FEATURES & SERVICES

- Microsoft® WINDOWS™ and Mouse with all 386 and 486 systems
- 30-day money-back guarantee
- One-year warranty on parts and labor
- Leasing options now available
- Toll-free technical support for the life of the machine
- Free on-site service to most locations in the nation
- Replacement parts sent via overnight shipping free of charge
- Free bulletin board technical support
- New sales hours: 7am-10pm CST M-F 9am-4pm CST Saturdays

NEW CRYSTAL SCAN 1024NI

- Our new 14" Gateway Crystal Scan 1024NI color VGA monitor comes standard with all 386 DX and 486 systems. This monitor

is non-interlaced for a flawless, flicker-free display. 1024 x 768 @ 60 Hz. 800 x 600 @ 72 Hz. 28 D.P.

We custom-build each Gateway 2000 computer to customer specifications. We'll gladly provide you with a quote on your configuration. 386 and 486 are trademarks of Intel Corporation. Due to the volatility of the DRAM market, all prices are subject to change. Prices do not include shipping.



8 0 0 - 5 2 3 - 2 0 0 0

610 Gateway Drive • N. Sioux City, SD 57049 • 605-232-2000 • Fax 605-232-2023

Starts With Values.



Kevin Costner photographed this same South Dakota buffalo herd for his movie, "Dances With Wolves."

Adrienne Garrigan,
Customer Service:
"My job is to keep my
customers informed. I
really push to make
sure we live up to our
commitments."



Wade Ridenour,
Sales: "I stress
listening. If you listen
to the customer, and
answer questions
honestly and
knowledgeably, the sale
will happen without
any high pressure
tactics or hype."



Tracy Ping, Technical
Support: "I think our
philosophy is unique in
the industry because no
matter what the
problem is, we do our
best to help our
customers."



We Value Integrity

Integrity is the fundamental value without which any organization is doomed. At Gateway 2000, you'll find integrity throughout the company, most visibly in sales and customer support. Gateway salespeople honestly represent the company and its products. Each person you deal with in customer support, during and after the sale, has a personal commitment to make sure you're completely satisfied. To provide the best value in the industry, Gateway 2000 must have integrity.

We Value You

Gateway customer Robert C. True, Jr., writes: "We on the East Coast have become so accustomed to surly, uninformed and disinterested...staff, that working with your group may have induced an element of 'Culture Shock.' Every person in your organization operates as if there is only one customer in the world—the one they are talking to at the moment. 'You've got a friend in the business' is more than a slogan. It's our way of life here at Gateway."

Gateway 2000 Assurances

Like most companies, Gateway 2000 offers a good written guarantee and warranty on all products. Unlike most companies, we treat each customer as an individual, taking special care to see that your individual situation is handled fairly. Your satisfaction is our number one priority.

30-Day Money-Back Guarantee

If you're unhappy with your Gateway 2000 purchase, for any reason, you can return the system within 30 days for a full refund.

One-Year Warranty

Every Gateway 2000 system comes with a one-year warranty on parts and service. If a part needs to be replaced, we'll quickly send a replacement part via overnight shipping free of charge. Beyond the warranty, we provide free telephone technical support for the life of your machine.

Free On-Site Service

If unusual difficulties occur, we can provide free on-site service to most locations in the country.

Credit Terms

You can purchase your Gateway 2000 system on C.O.D. terms or with American Express, Discover, Visa, or Mastercard. Net 30-day credit terms and leasing options are also available to qualified buyers.

New FCC and Product Development Labs

As an added assurance to you that your Gateway 2000 system will comply with all FCC certification requirements, we've just installed a new FCC testing lab in our recently expanded 70,000 square-foot manufacturing facility. We've also expanded our product development lab in which we are continually testing new components. The quest for even better price/performance computer systems never ends at Gateway.

New Sales Hours

For your convenience, we've expanded our sales hours. New sales hours are from 7 a.m. to 10 p.m. (CST) Monday through Friday and 9 a.m. to 4 p.m. Saturdays.



8 0 0 - 5 2 3 - 2 0 0 0

610 Gateway Drive • N. Sioux City, SD 57049 • 605-232-2000 • Fax 605-232-2023

First Looks

Northgate OmniKey 101: Keyboard with Versatility

HANDS ON
by Bill Machrone

Over the years, Northgate sold keyboards with the function keys on the left, the way they were on the original PC and the early PC ATs. Today, however, a whole generation of users has never seen a keyboard with the function keys on the left, much less yearned for one.

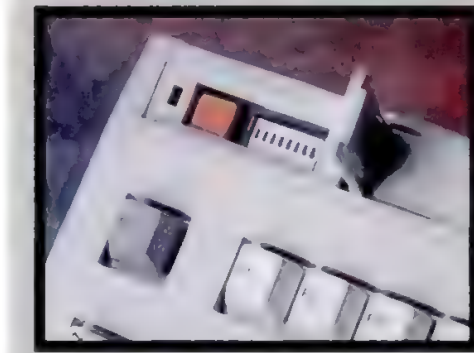
So Northgate has gone mainstream and now offers a standard 101-key layout on the \$89 OmniKey 101. The new layout combines all of the features that have made Northgate keyboards famous, including the excellent Alps keyswitch. And thanks to some innovative design, it's one of the most versatile keyboards yet.

Hidden beneath the keyboard's Northgate logo lies the secret to the OmniKey's flexibility: an eight-position DIP

switch and an option-select push button. With them, you can configure the OmniKey to virtually any type of computer. You can shift the position of the Ctrl, Alt, and Caps Lock keys if, for example, you prefer the Ctrl key to be located next to the A key.

You can swap the Backslash and Asterisk keys, and you can even set the keyboard to one of three Dvorak layouts, although you must purchase Dvorak key caps separately, since each row is sculpted differently. Another switch lets you make the left-side Ctrl, Shift, and Alt keys "sticky," for users with limited dexterity or for those who use a mouthstick. The keyboard comes with a key cap puller to make these swaps easy.

The repeat rate, delay time, and validation time are all adjustable by using the option-select button and various key



The OmniKey 101's secret to success lies under its logo/door where a bank of DIP switches lets you customize the keyboard.

combinations. Most users will prefer a higher repeat rate and a shorter delay time before auto-repeat kicks in. However, a user with limited eye-hand coordination may appreciate a slow validation time that ignores false tries. It may take the user a moment or two to remove his finger or the mouthstick, so a longer delay time or slower auto-repeat can also be a boon.

The option-select settings are in effect only until you shut off the computer, but Northgate bundles keyboard utility programs with its systems and offers them on CompuServe and its corporate bulletin board so

that you can put your favorite settings into a batch file. You can also buy the disk for \$7.95.

People can say all they like about tactile versus audible feedback, but keyboard preferences actually fall into two groups: clicky versus mushy. Northgate has always been in the clicky camp, and the OmniKey 101 is the ideal antidote to mushiness. Its crisp feel, heavy steel baseplate, and flexible options make it a winner. ■

List Price: OmniKey 101, \$89. Northgate Computer Systems, P.O. Box 59080, Minneapolis, MN 55459-0080; 800-538-1993.

CIRCLE 706 ON READER SERVICE CARD

Professor Windows Painlessly Raises Your Windows IQ

HANDS ON
by Robert Ross

Windows 3.0 painted a rosy picture for C-prompt-weary PC users, but it turns out that life with a mouse and icons takes some training. If your readjustment period hasn't been easy, *Professor Windows*—a self-paced, disk-based Windows tutorial for \$49.95—may be just the thing to help you from clicking yourself into a frenzy.

Ironically, you'll need to have Windows installed before you can run *ProfWin*, but the rest of *ProfWin*, which occupies about 2MB on your hard disk, is straightforward. With clean graphics and careful prose, the tutorial (which is really a series of DLLs) covers everything from using a mouse, to customizing your desktop, to using the Windows accessories.

In an entertaining but never

demeaning fashion, *ProfWin* provides tutorials, poses questions, offers mini-activities, and tests your knowledge throughout its sessions. When you answer a question incorrectly, a pop-up box gently hints at (read: tells you) the correct answer.

There are six sections. Start-up offers an overview of Windows. Basics explains dialog boxes and pull-down menus, and offers practice in on-screen windows manipulation and desktop customization. The Tasks section takes you into the Program and File Managers. You'll learn to add programs, groups, and icons to your desktop, and practice manipulating files and directories. The Accessories section makes you feel at home using Windows' "applets": Write, Paintbrush, and Terminal. It'll also introduce you to the Macro Recorder and PIF editor, although with these

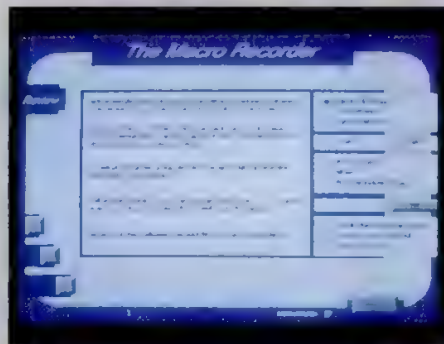
you won't delve as deeply as you might like. The Printing portion teaches you to use the Print Manager. Finally, the Advanced section gives you enough solid information about topics such as Swap files, SmartDrive, RAMDrive, and DDE to make you literate, but not fully competent.

Geared for newcomers, but with enough substance to keep intermediate users interested, *Professor Windows* will raise

your Windows IQ and lower your frustration level. ■

List Price: *Professor Windows*, \$49.95. **Requires:** Hard disk, one 1.2MB 5.25-inch or 720K 3.5-inch floppy disk drive; EGA, VGA, Hercules, or compatible graphics adapter card; Windows 3.0 or later. Individual Software Inc., 125 Shoreway Rd., #3000, San Carlos, CA 94070-2704; 800-331-3313, 800-874-2042 (in Calif.).

CIRCLE 436 ON READER SERVICE CARD



At the end of each session, *Professor Windows* springs a little quiz to make sure that you have mastered the lesson.

First Looks

Recognita Plus: OCR With Strength in Hardware

by Barry Common

Recognita Plus, a \$495 OCR package, supports myriad scanners but fails in recognition accuracy compared with industry leaders: Calera's *WordScan* and Caere's *OmniPage*.

It includes two separate versions—one for DOS and one for Windows 3.0. The former is attractive thanks to low hardware requirements; I was able to run it with only about 440K free.

Recognita Plus's scanner support is excellent, with 70 models accommodated. Other top-selling packages don't support some of the less-common scanners that it does, including Chinon, Sharp, and Siemens.

Recognita Plus uses Omnifont technology; it tries to read any font based on pattern recognition. I composed an especially difficult page to be scanned and recognized using a mixture of

14-point Broadway, Cooper Black, and Park Avenue. I ran it through both *Recognita Plus* and *WordScan Plus*. Both failed on recognizing Park Avenue but got enough right in other fonts to illustrate their ability to handle previously unknown fonts.

You can prescan a page and mark off regions for *Recognita Plus* to ignore or use. For simple multicolumn text, *Recognita*

Plus can automatically split the columns if you tell it you have a multicolumn source.

Recognita Plus is a speedy performer. Our tests showed *WordScan Plus* took 1.5 to 3 times as long as *Recognita Plus*, and *Recognita Plus* was roughly as fast as *OmniPage*.

But the key aspect of OCR is accuracy. *Recognita Plus* did well on 12-point plain Courier, but underlined text left it stymied. Smaller point sizes, proportional fonts, or dot matrix print quality produced poor results when compared with other OCR packages. On one sample with 600 words of 12-point Times Roman LaserJet output,

WordScan had 10 errors, while *Recognita Plus* had 41.

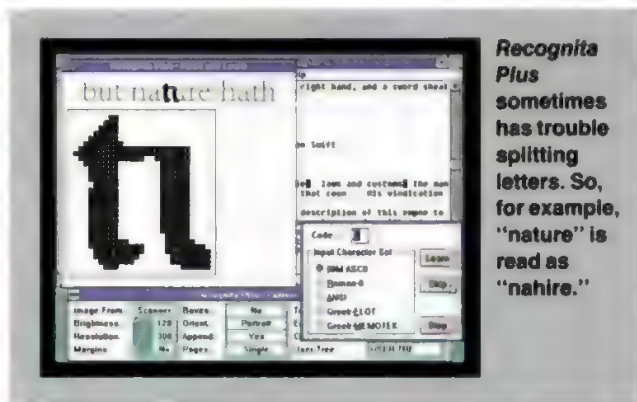
Each of *WordScan*'s errors was flagged as a questionable letter and/or a spelling mistake; *Recognita Plus* spotted only 11 errors, which were flagged as questionable letters.

Recognita USA would do well to add spelling technology. This would have flagged errors like "empue" for "empire." Also needing work is lowercase "n" and "r" recognition.

Because it supports a wide variety of more esoteric hardware, *Recognita Plus* may be an acceptable choice for many users. However, its lack of accuracy should be carefully weighed before a purchase. ■

List Price: *Recognita Plus*, Version 1.1W, \$495; version with support for Spanish, Portuguese, and French character sets, \$595, 20-language "International" version, \$795. **Requires:** 640K RAM, graphics monitor, DOS 3.0 or later, supported scanner. The international version is copy protected. *Recognita USA* Corp., P.O. Box 0218, Los Angeles, CA 90048; 408-749-9935.

CIRCLE 432 ON READER SERVICE CARD



Recognita Plus sometimes has trouble splitting letters. So, for example, "nature" is read as "nahire."

Pioneer Seeds the Market with CD-ROM Jukebox/Software Bundle

by Matt Hume

Nowhere is the chicken and egg paradox better exemplified than in the fit between hardware and software. With its new CD-ROM bundle, Pioneer eliminates the dichotomy by joining a CD-ROM jukebox to a collection of software that puts it to work.

The centerpiece of this new offering is Pioneer's DRM-600 CD-ROM Minichanger, an \$1,295 optical jukebox that automatically sorts through up to six CD-ROM disks. To help you fill it, Pioneer has put together a six-pack of disks that just may amount to the biggest bargain in digital data today.

For \$395, the company offers \$1,256 worth of information in the form of the following disks: *U.S. History on CD-*

ROM, *Countries of the World*, *Shakespeare*, *Sherlock Holmes*, *Birds of America*, and a *Movie Database/Software Potpourri*/King James Bible collection.

The CD six-pack also eliminates having to deal with the profusion of retrieval software. Instead of each six-pack requir-

ing its own software, one retrieval system (*Disk Passage* from CMC Research) handles all six disks.

The Minichanger, a 4.5- by 8.25- by 15-inch external chassis, holds any six CD-ROMs in a removable plastic carrier. Once installed, each disk appears as a separate drive letter.

Although only one disk is accessible at a time, the Minichanger shifts between them

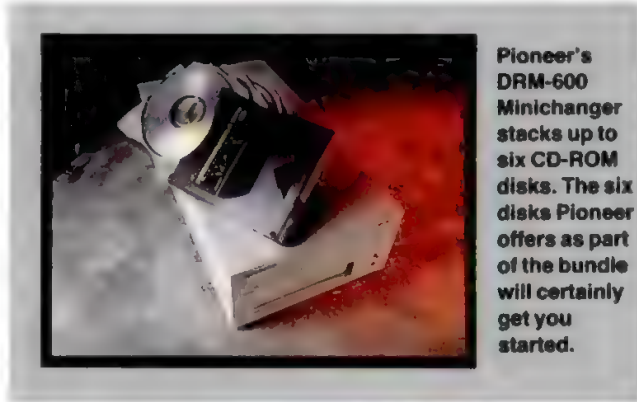
about 7 seconds. The access time within a single disk is 600 milliseconds.

Should you get bored paging through the equivalent of 1,800,000 pages of text that the DRM-600 can store, the Minichanger will also play your favorite music CDs using Pioneer's jukebox software, which is included on a floppy disk.

The Minichanger connects to your system through a SCSI link. If you don't have a SCSI host adapter, Pioneer offers a \$100 DRM-PC kit that includes both a Future Domain SCSI host adapter and a SCSI cable. The DRM-600 Minichanger also includes the Microsoft CD-ROM extension software. ■

List Price: DRM-600 Minichanger, \$1,295; software six-pack, \$395. Pioneer Communications of America, 600 E. Crescent Ave., Upper Saddle River, NJ 07458; 800-527-3766, 201-327-6400.

CIRCLE 431 ON READER SERVICE CARD

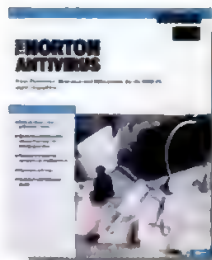


Pioneer's DRM-600 Minichanger stacks up to six CD-ROM disks. The six disks Pioneer offers as part of the bundle will certainly get you started.

PETER NORTON NOW CURES VIRUSES.



Warning. Peter Norton has determined that PC viruses can be hazardous to your data. So to combat the threat, he's developed the Norton AntiVirus™



Peter Norton

the only comprehensive virus protection, detection and elimination software for DOS.

The Norton AntiVirus stops viruses dead in their tracks before they infect your system. It also exterminates viruses already living on your hard disk or floppies. And it operates invisibly in the background, alerting you only when a virus is detected.

For protection against new viral strains, just call the 24-hour Virus Newsline. It's a free service that provides new virus information and easy instructions to keep your virus protection up to date, without the need to upgrade your software.

The Norton AntiVirus is 100% compatible with PC networks like Novell® and 3Com®. MIS managers can configure and password protect the Norton AntiVirus to meet their corporate needs.

And of course, it's Windows® compatible.

All this protection is yours for only \$129*, with a 60 day money-back guarantee.

Take it from Peter Norton. If your PC is unprotected, do the right thing: Pick up a copy of the Norton AntiVirus. Call for more information.

1-800-343-4714, Ext. 711 P

SYMANTEC.

*Suggested retail price. © 1991 Symantec Corporation. The Norton AntiVirus is a trademark of Symantec Corporation. All other brand or product names mentioned are trademarks or registered trademarks of their respective holders.

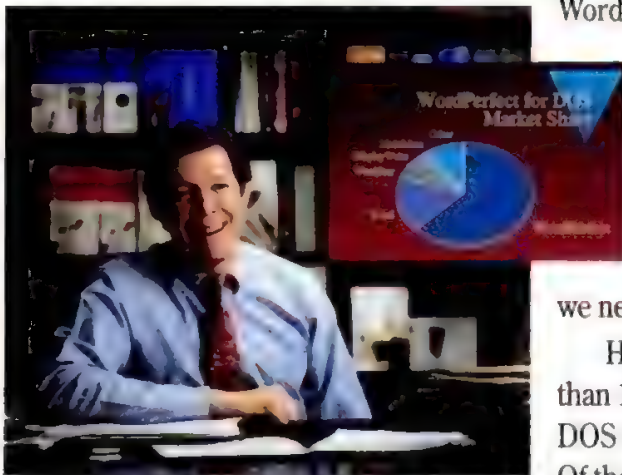
CIRCLE 264 ON READER SERVICE CARD

WordPerfect® for Windows promises to be a sure thing, but sales projections are anyone's guess.



In a short time, WordPerfect® for Windows will debut on dealer shelves throughout the English-speaking world. This new word processor combines the powerful features of our world-famous

WordPerfect for DOS with the ease-of-use of a graphical interface.



While we're confident WordPerfect for Windows will live up to our standards as the industry leader, we are much less confident about our sales projections. Our Vice President of Product Marketing, Clive Winn, is having trouble predicting how many copies

we need to produce for our first month's orders.

Here are some questions he must consider. Of the more than 150,000 people who purchase a copy of WordPerfect for DOS each month, how many will prefer a Windows product? Of the more than six million WordPerfect for DOS users

worldwide, how many will take advantage of our \$125 trade-up to WordPerfect for Windows in the first month? Of the 40,000 people who purchase a Windows word processor each month, how many will prefer WordPerfect for Windows instead of the products they are now buying? And of the two million or so Windows owners who have not purchased a word processor, how many are waiting for WordPerfect?



The more we look at all the variables, the more we think we need your help. So we're going to do what we do best; listen to what you, our current and potential customers, have to say. We'd like you to call us at (800) 526-5069 between the hours of 9:00 a.m. and 5:00 p.m. MST on or before April 30, and make a projection of the public's demand for WordPerfect for Windows during its first month on the market.

Historically, we have received orders from eager

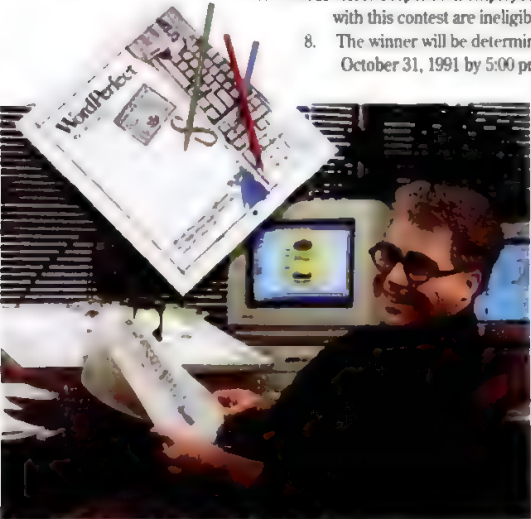
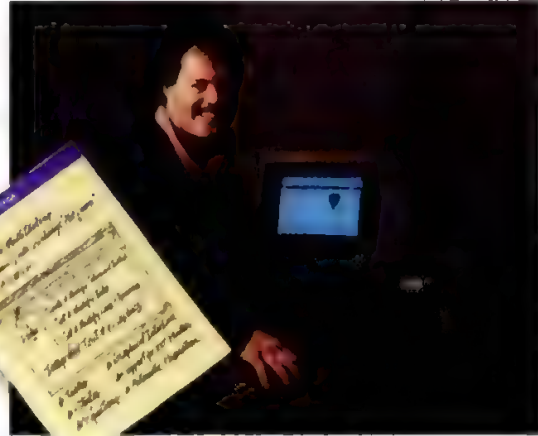
customers before the product officially is available for purchase. Therefore, you will need to include these advance orders of WordPerfect for Windows as part of your estimate of the total number of orders placed during the first 30 days after the product officially becomes available. We will use your estimate to help us project an appropriate number of units to meet our first month's demand.

Give us your best guess and we'll make it worth your while. We will reward the person whose estimate comes closest to the actual number of copies ordered during the specified time period with \$25,000. So, get out your calculator, some paper and pencils, and possibly your algebra book, and call us with your estimate.

We are anxious to bring you WordPerfect for Windows. We think it will live up to your highest expectations.

Official Rules:

1. Each entrant must provide his/her name, address, and daytime phone number. One estimate per person. Anyone submitting more than one estimate will be disqualified.
2. Contest estimates will only be received between March 18, 1991 and April 30, 1991, and they must be called in using the 800 number provided. Entrants must call in their estimates before 5:00 pm MST, April 30, 1991 to be eligible for the award.
3. Entrants must be at least 18 years of age and residents of either the U.S. or Canada. Residents of the Province of Quebec, Canada are not eligible. Offer void where prohibited by law.
4. No purchase necessary to enter. The odds of winning will depend upon the number of entries received.
5. There will be only one winner—that person whose estimate comes closest to the actual number of units ordered from WordPerfect Corporation through its distribution channel and direct from its customers within the 30 day period as described above. In case of a tie, the person with the earliest estimate will be declared the winner.
6. The prize consists of \$25,000 and one first-class, round-trip ticket to Salt Lake City, Utah. The trip will include one night's stay, food and lodging at an area hotel (tax and tip included), as well as ground transportation for a total estimated value of \$27,000. The winner will be responsible for all federal and local taxes. The winner must travel to WordPerfect Headquarters in Utah to be presented with the prize check. The prize, including the trip, is not transferable.
7. WordPerfect Corporation employees, families, affiliates, related companies, distributors and dealers, all suppliers and all persons connected with this contest are ineligible.
8. The winner will be determined by the accounting firm of Price Waterhouse and the winner will be notified by telephone on or before October 31, 1991 by 5:00 pm MST. In the event that the winner is unreachable by phone, he/she will be notified by mail.
9. Winner grants WordPerfect Corporation permission to use his/her name and/or photograph for advertising and/or promotional purposes without additional compensation.
10. To obtain a winner list, or to find out the actual number of units ordered, send a stamped, self-addressed envelope to WordPerfect Corporation, Attn: D. Clive Winn, Winner List, 1555 N. Technology Way, Orem, Utah 84057.
11. The statistical information provided above is WordPerfect Corporation's interpretation of research from International Data Corporation.
12. Winner may be required to sign an affidavit of eligibility and/or a liability release.
13. Canadian residents only: If the entrant who comes closest to the actual number of units ordered is a Canadian resident, he/she will be required to correctly answer a skill testing question of a mathematical nature. This entrant will be given at least 24 hours notice as to when the question will be posed.

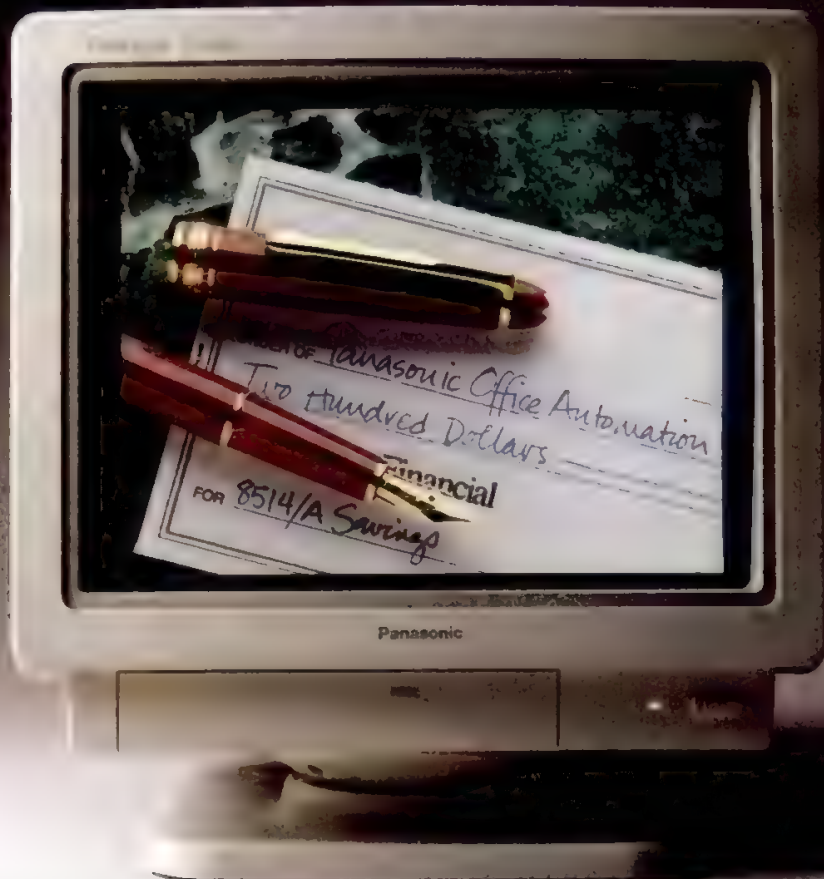


WordPerfect
CORPORATION

WordPerfect is a registered trademark of WordPerfect Corporation within the United States and other countries. All other brands and product names are trademarks or registered trademarks of their respective companies. © 1991 WordPerfect Corporation.

Introducing the PanaSync™ C1381 Monitor

8514/A resolution. VGA price.



If you want the ultimate VGA graphics standard, and you've resigned yourself to paying a premium of hundreds of dollars to get it, you'll find our newest monitor pleasant viewing indeed.

The PanaSync C1381 gives you a sharp 1024 x 768 pixels, with 0.28 dot pitch. And virtually infinite color resolution.

It's compatible with the most popular VGA boards, as well as analog RGB, MCGA, SuperVGA, and — of course — 8514/A standards.*

It's comfortable in virtually any IBM-compatible or Mac II environment.**

And it's a masterpiece of ergonomics. With front-mounted controls, tilt/swivel stand, plus a non-glare tinted black-matrix screen.

All this at a suggested retail price comparable to many of the ordinary VGA monitors on the market right now. For more information, simply call toll-free 1-800-742-8086.

*Peripherals. Computers. Printers.
Copiers, Typewriters and Facsimiles*

Panasonic
Office Automation 

PanaPro™ Monochrome Desktop Publishing Monitors with Video Adapters.



(Mac SE)

(Mac II)

(IBM XT/AT & PS/2 Model 30)

PanaSync™ Multiscanning Color Monitors.



* VGA, MCGA and 8514/A are trademarks of International Business Machines Corp.

** IBM XT, AT and PS/2 are registered trademarks of International Business Machines Corp. Macintosh is a registered trademark of Apple Computer Inc. An optional cable is required for Macintosh.

by
Cristina Córdova
and Nate Zelnick

New & Improved

News of Announced Products and Upgrades

Portable Network Adapters for Ethernet, ARCnet, Token-Ring

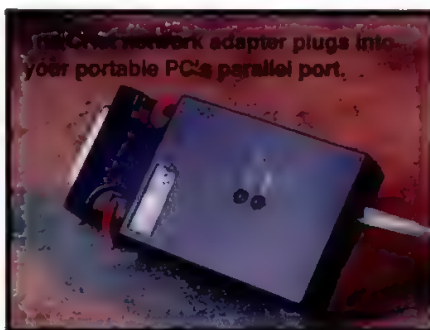
NEW Bridging the gap between networks and laptops, CNet has designed a series of portable Ethernet, ARCnet, and Token-Ring network adapters. The adapters connect to the parallel port interface, supporting both unidirectional and bidirectional modes. CNet has bundled each portable unit with preconfigured Novell IPX software drivers that support ELS, NetWare 286, and NetWare 386 networks.

CNet offers two \$399 Ethernet models, the CN50ET and the CN50E. The CN50ET supports unshielded, twisted-pair cabling while the CN50E supports coaxial cabling.

The CN50A, priced at \$259, supports ARCnet and Token-Ring networks and works with both star and bus topologies as well as coaxial and unshielded twisted-pair cabling.

List Price: CN50ET and CN50E, \$399; CN50A, \$259. CNet Technology Inc., 2199 Zanker Rd., San Jose, CA 95131; 408-954-8000.

CIRCLE 442 ON READER SERVICE CARD



\$99 Serial Device Driver Lets Windows Access Five COM Ports

NEW With the release of a Windows device driver, Cherry Hill Software hopes to open up new possibilities for bulletin board software and manufacturing-control applications under Microsoft Windows.

The \$99 W3COM5 serial driver supports up to five COM ports under Windows 3.0, instead of the usual two-port limit. Cherry Hill Software designed the driver to work with

DigiBoard's DigiChannel PC/4 serial board and a standard serial port.

List Price: W3COM5, \$99. **Requires:** DigiChannel PC/4 serial board, Windows 3.0. Cherry Hill Software, 1930 E. Marlon Pike, Bldg. O, #76, Cherry Hill, NJ 08003-4204; 609-751-2809.

CIRCLE 443 ON READER SERVICE CARD

Printer-Sharing System Uses Parallel Ports and Spans Up to 1,200 Feet

NEW Data Spec has designed an advanced modular printer-sharing system, Para-Link Plus, which enables as many as 16 users to send data to a single parallel printer over a 1,200-foot area.

Individual transmitters plug into the PCs' parallel ports, and a single receiving unit attaches to the parallel port of the printer.

The Para-Link Plus starter kit, for \$199, includes one transceiver and two 25-foot modular cables. You can purchase an expansion kit for \$74.95. This includes one transmitter and one 25-foot cable. Data Spec claims a data transmission rate of up to 6,000 characters per second, and the system features collision protection and timeouts.

List Price: Para-Link Plus starter kit, Model PL3, \$199; Para-Link Plus expansion kit, Model PL4, \$74.95. Data Spec, 9410 Owensmouth Ave., Chatsworth, CA 91311; 818-772-9977.

CIRCLE 444 ON READER SERVICE CARD

HOT PROSPECT

MICROSOFT'S TRAVELING BALLPOINT MOUSE CLIPS TO THE SIDE OF LAPTOPS

Microsoft has finally produced a pointing device for laptop owners who need something more compact than a mouse. The BallPoint Mouse attaches to the side of a laptop keyboard and should make mouse-based computing possible even on an airplane tray.

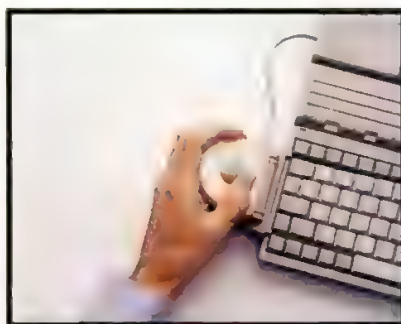
More like a trackball than a mouse, BallPoint lists for \$175 and offers 400-character-per-inch resolution. It comes with a combination serial-PS/2 mouse interface and three sets of clamp fasteners for mounting on different types of keyboards.

To ensure compatibility, BallPoint uses the standard Microsoft Mouse driver. Users can select speed and click sensitivity levels and directions according to the mouse's orientation. And a utility called MenuMaker enables users to add mouse support to non-mouse applications.

List Price: BallPoint Mouse, \$175.

Requires: 20K RAM; 1.44MB 3.5-inch floppy disk drive; a 9-pin serial port or PS/2 mouse port; DOS 2.0 or later, or OS/2, Version 1.1 or 1.2. Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 206-882-8080, 206-454-2030.

CIRCLE 441 ON READER SERVICE CARD



BallPoint Mouse plugs into a 9-pin serial interface or a PS/2 mouse port.

Printer-Sharing Device Manages File Transfers

NEW PrintDirector Gold, a printer-sharing device from Digital Products, offers file transfer, high-speed graphics printing, and a number of printer management features. Its file-transfer feature lets networked PCs easily exchange files without using the DOS command line. A split screen displays local and remote directories simultaneously to facilitate the file-transfer process.

According to Digital Products, the product has a printing throughput of 12,000 characters per second and offers a 1MB print buffer. In addition, PrintDirector Gold supports PostScript emulation cartridges. For information

CONTINUES ON PAGE 56

BRIEFS



PRINTERS

Abaton's \$1,995 PostScript printer, the LaserScript LX,

features a 25-MHz National Semiconductor processor. With 300-dpi resolution and a print speed of 6 ppm, the printer provides 35 Bitstream fonts for PostScript emulation and 24 bitmapped fonts for HP LaserJet II PCL-4 emulation. 415-683-2226.

Kodak's Ektaplug 7008 (\$2,095) is a high-performance, 8-ppm laser printer. It offers 300-dpi resolution and comes with 1.5MB of RAM standard. 800-344-0006.

Star Micronics has introduced an affordable RISC-based laser printer. The \$1,495 LaserPrinter 4 features 1MB RAM, a print speed of 4 ppm, and high-speed throughput of complex graphics. Star Micronics has bundled the printer with a UDP Turbo25 cartridge that contains 151 fonts. 800-447-4700.



SCSI ADAPTERS

Adaptec has unveiled a pair of SCSI host adapters that support the new Fast SCSI devices in EISA microcomputers—the AHA-1740 and the AHA-1744. For under \$500, both adapters transfer 32-bit data to and from memory at 33MB per second and achieve synchronous data transfer at 10MB per second between the host and its SCSI peripherals. 408-945-8600.

Axes Technologies is now shipping the SOFI-16 SCSI caching controller. The 16-bit controller features an on-board CPU that manages the connected SCSI devices, the cache memory, and the host interface. The controller comes in 1MB (\$695), 2MB (\$845), and 4MB (\$1,095) configurations. Device drivers support mag tapes, CD-ROM, and optical drives. 214-446-2937.

Distributed Processing Technology has announced the SmartCache Plus SCSI controllers. The basic ISA or EISA card offers bus mastering with full SCSI disk and device compatibility, including support for SCSI-2 peripherals. The cache-convertible controller for ISA-bus systems is priced at \$595, a system with a floppy disk drive sells for \$655, and controllers for EISA-bus systems are \$785. 407-830-5522.

on Digital Products' other printer-sharing package—PrintDirector Silver—see "Building Workgroup Solutions: Buffered Printer-Sharing Devices" in this issue.

List Price: PrintDirector Gold, 6-port model, \$995; 10-port, \$1,395; 16-port, \$2,395. Digital Products Inc., 108 Water St., Watertown, MA 02172; 800-243-2333, 617-924-1680.

CIRCLE 446 ON READER SERVICE CARD

Cordless Mice Conform To Ergonomic Needs

NEW Two mouse manufacturers have new designs for people who want to clear away the wires cluttering their desk.

The \$164.95 Cordless Super Mouse from Z-Nix features 400-dot-per-inch resolution and infrared technology. Its infrared receiver serves as a mouse stand and houses a rechargeable battery pack. Z-Nix packages its Cordless



The Cordless Super Mouse rests on an infrared recharging stand.

Super Mouse with two 8-hour batteries for uninterrupted use, and an intelligent driver lets you vary cursor speed. A Cordless Super Mouse/Microsoft Windows 3.0 bundle is also available for \$313.95.

The MouseMan family from Logitech represents a new ergonomic design available in either a traditional wire-based or cordless version. Logitech offers serial, bus, or PS/2 models in both right- and left-handed versions, as well as a cordless unit that is based on radio technology. The prices range from \$119 to \$199, depending on the particular configuration.

All MouseMan models offer 400-dpi resolution, on-line ballistics, and cursor control. Logitech bundles its mice with MouseWare 5.0, the latest version of Logitech's driver and menu utility software.

List Price: Cordless Super Mouse, \$164.95; Windows 3.0 bundle, \$313.95. Z-Nix Co. Inc., 211 Erie St., Pomona, CA 91768; 714-629-8050.

CIRCLE 446 ON READER SERVICE CARD

List Price: MouseMan, \$119 to \$199. Logitech Inc., 6505 Kaiser Dr., Fremont, CA 94555; 415-795-8500.

CIRCLE 447 ON READER SERVICE CARD

Laser Pal 386SX PC Integrates Voice Mail With Fax and Modem

NEW Intended for professionals who prefer to work at home or entrepreneurs starting a home-based business, **Laser Computer's** Laser Pal 386SX features fax and voice mail functions.

For \$2,995.95, the system contains a 16-MHz 386SX CPU, 1MB of RAM, 40MB hard disk, one 1.2MB 5.25-inch and one 1.44MB 3.5-inch floppy disk drive, a 14-inch enhanced SVGA color monitor with 1,024-by-768 resolution, and a 2,400-bps internal modem. Four SIMM sockets offer RAM expansion to 4MB, and four 16-bit expansion slots provide addition system expansion.

Laser Computer packages the Laser Pal with both *The Complete Communicator* and *GeoWorks Ensemble*. With *The Complete Communicator* package, users may create an integrated fax and voice mail system for the home office.

List Price: Laser Pal 386SX, \$2,995.95. Laser Computer Inc., 800 N. Church St., Lake Zurich, IL 60047-1596; 708-540-8086.

CIRCLE 448 ON READER SERVICE CARD

Report Generator Reads SQL, Writes Rich Text

NEW Humanics Systems has taken a unique approach to database reporting; rather than reinvent the wheel with a new report generator, the company has built a bridge between SQL databases and Microsoft Word for Windows.

WinList SQL is a database report generator that sits on top of *Microsoft Word for Windows* and reads records from a number of single- and multiuser SQL database back ends. Designed for ease of use, *WinList SQL* creates reports in Rich Text Format (RTF), which *Word for Windows* directly supports. Users can manipulate data by cutting and pasting cell ranges from reports into spreadsheets.

WinList SQL lets you interactively define a wide variety of reports and store the definitions in the database. It will work with any database that can be accessed from *SQL Windows*, including *SQLBase*, *SQL Server*, *Oracle*, and *DB2*.

The program also provides a number of formatting choices, including font and font sizes, line spacing, cell formats, and optional field borders. Users may also change the data-selection criteria in the SQL statements.

List Price: *WinList SQL* single-user version, \$195; multiuser version, \$595 for the first ten users. **Requires:** Gupta Technologies' *SQL Windows*, (runtime version), *Microsoft Word for Windows*. Humanics Systems Inc., 1482 Mecaslin St. NW, Atlanta, GA 30309; 404-874-2176.

CIRCLE 449 ON READER SERVICE CARD



Introducing Borland's ObjectVision. Now, Anyone Can Build Business Applications for Windows

There has never been anything like ObjectVision.™ For the first time ever, nontechnical business professionals can develop and maintain their own software applications—quickly and easily.

Imagine the benefits:

- Get new Windows programs up and running quickly
- Build database front ends easily
- Connect to corporate databases and other Windows applications
- Reduce the time needed for user training
- Eliminate the programming backlog

Visual Programming

With ObjectVision, Borland introduces a revolutionary concept in software—visual programming. Now, if you can picture your application, you can create it yourself:

1. Decide what you want your application to look like.
2. Draw the decision tree that controls the logic of your application.

Add spreadsheet formulas for calculations. Or, link your program to other Windows applications or databases. The uses are limitless.

Special, Limited Time Offer*

With our introductory price of only \$99⁹⁵ (\$495 suggested retail price) and a 60-day, money-back guarantee, now is the time to look at ObjectVision.

**See your dealer, or
call NOW
1-800-331-0877**

ObjectVision is also available in a Run-time version that allows you to distribute ObjectVision applications to other users.



B O R L A N D

Makers of Paradox®, Quattro® Pro, Turbo C++, Turbo Pascal® and Sidekick®

CODE: MV15

*Offer ends May 31, 1991. Offer good in U.S. and Canada only. Tyco Pre-School Super Blocks used with permission of Tyco Industries, Inc. Copyright © 1991 Borland. BI 1398

CIRCLE 295 ON READER SERVICE CARD

BRIEFS

**CLIPPER ADD-ONS**

Geller Software is shipping *Jack Geller's Spell Checking Engine*, which adds spell-checking to *Clipper* and C applications. The \$249 engine contains a function library that consists of object modules, an English-language dictionary with over 100,000 words, and a maintenance program for creating and modifying dictionaries. 914-357-2055.

SilverWare designed *SilverClip SPCS* to give *Clipper* applications high-performance interrupt-driven control of asynchronous communications. The \$349 customizable communications library allows you to access an unlimited number of COM ports simultaneously. It supports Smartmodem, video functions, remote input, and Digiboard's 4-, 8-, and 16-port boards. 619-450-1960.

SuccessWare's CLIP2EB is one of the first toolkits to support *Clipper* 5.0. The \$199 library has tools for accessing *Emerald Bay's* database engine technology and for accessing a variety of binary file formats. It allows you to use .DBF files side by side with *Emerald Bay* files. 714-699-9657.

**BUSINESS SOFTWARE****Business Resource**

Software has created an analysis tool for gathering knowledge and formulating strategies for business planning—a package called *Business Insight*. The \$495 program comes with an easy-to-use, outline-style interface. 512-251-7541.

Hi Tech Enterprises' Employee Evaluator and Salary Manager provides a programmable tool for automated, consistent, written evaluation documentation and salary distribution. Evaluations are based on the employer's own criteria for targeting specific company needs. 800-437-1222, 408-373-5117.

Peachtree Software has developed an accounting package for *Windows* 3.0, *Crystal Accounting*. The \$495 package contains six modules including General Ledger, Accounts Payable and Receivable, Invoicing, Payroll, and a Financial Report Writer. 404-876-4482.

DataProducts Printer Has 96 Internal Fonts

NEW With so many laser printers being shared, it makes sense to put more resources into a single device. The \$3,695 **DataProducts LZR 1650** contains 96 resident fonts and offers support for two font cards and downloadable fonts. It comes with an HP LaserJet IID emulation. The high-performance controller includes 1MB of memory (expandable to 5MB), and Flash EEPROMs, which allow you to download additional emulations or upgrade firmware. Paper handling consists of two 350-sheet paper cassettes. Envelope cassettes (70 envelopes) and high-capacity sheet feeders (2,500 sheets) are also available.

List Price: LZR 1650, \$3,695. DataProducts Corp., 6200 Canoga Ave., Woodland Hills, CA 91367-2499; 800-624-8999, 818-887-8000.

CIRCLE 480 ON READER SERVICE CARD

300-dpi Color Thermal Printer Powered by a RISC Microprocessor

NEW General Parametrics has added a new product to its Spectra*Star 400 series. Like the other members of its family, the Spectra*Star 430 is a color thermal printer; however, it features unique on-board high-speed processing of PostScript images. In addition, General Parametrics has based the printer on an architecture powered by a 20-MHz Intel 80960 RISC microprocessor for maximum throughput.

For \$7,995, the printer comes with 6MB of RAM and 35 PostScript-compatible fonts. Using the latest thermal wax-transfer technology, it provides 300-dpi resolution and high-quality color images. To enhance network performance, the 430 can be upgraded to the 440, which features a built-in high-performance 30MB hard disk.

List Price: Spectra*Star 430, \$7,995. General Parametrics Corp., 1250 Ninth St., Berkeley, CA 94710; 415-524-3950.

CIRCLE 706 ON READER SERVICE CARD

18-Pin Printer Reaches Speeds Up to 23 ppm

NEW Designed for heavy-duty business use, **Seikosha's BP-5780** is an 18-pin dot matrix printer. Its high-speed printing of up to 780 characters per second combines with its seven-part-form-handling abilities for a potential 23-page-per-minute yield. The \$2,200 unit comes with a software menu system (with memory), which controls a 41-function front panel. Paper-handling capabilities include a tilted push tractor, twin paper-out sensors, auto-load and

auto-scroll, automatic zero tear-off, and paper parking.

The BP-5780 emulates the Epson FX-1050, the IBM Proprinter III XL, and the Seikosha BP-A or BP-I printer command responses. It also offers 95 ASCII characters, international symbols, and 256 downloadable characters. Optional ROM adds up to seven fonts to its built-in Roman and sans serif selections.

List Price: Seikosha BP-5780, \$2,200. Seikosha America Inc., 10 Industrial Ave., Mahwah, NJ 07430; 800-338-2609, 201-327-7227.

CIRCLE 701 ON READER SERVICE CARD

\$399 24-Pin Panasonic

NEW The \$399 KX-P1123, **Panasonic's** new 24-pin printer, features seven resident fonts, output speeds up to 240 characters per second, and versatile paper handling, including push/pull tractor and paper parking. It comes standard with a 10K buffer (expandable to 42K) and a Centronics parallel interface. An RS-232C serial interface is optional. The printer incorporates IBM Proprinter X24 and Epson LQ-850 emulations.

List Price: KX-P1123, \$399. Panasonic Communications and Systems Co., Two Panasonic Way, Secaucus, NJ 07094; 800-742-8086, 201-348-7000.

CIRCLE 708 ON READER SERVICE CARD



The EnvelopeJet 250 feeds standard business envelopes to your laser printer.

Mass-Mailing Tools For Your Laser Printer

NEW Elite Business Applications has launched two products that can help bring laser quality to mass mailings. The \$499 EnvelopeJet 250 automatically feeds up to 250 standard business envelopes to HP and HP-compatible laser printers. Elite's 25 Plus/Charisma multifont cartridge includes a font that will translate numerical ZIP codes to bar codes.

List Price: EnvelopeJet 250, \$499. Elite Business Applications Inc., 1411 Walnut St., #200, Philadelphia, PA 19102; 800-942-0018.

CIRCLE 702 ON READER SERVICE CARD

"Who would you expect to give you the best compiler for creating Windows applications?"

—Answer below

Introducing a vastly superior way to write applications for Microsoft® Windows. New Borland® C++. The only complete C and C++ programming environment for DOS and Windows. Borland C++ generates Windows applications and DLLs,* supports Windows debugging, and includes a visual resource editor. So you don't need to buy the Microsoft Windows Software Development Kit (SDK).

Borland C++ is from the people who know what professional programmers want. In fact, Turbo C++ Professional (the predecessor to Borland C++) won both *PC Magazine's* 1990 Technical Excellence Award and *BYTE's* 1990 Award of Excellence.

Designed for professionals by professionals

Every copy of Borland C++ comes with:

- ANSI C compiler and C++ compiler
- Turbo Drive™ compiler and integrated development environment running in protected mode for huge capacity
- Precompiled headers that significantly increase recompilation speed
- Turbo Debugger® for DOS and Windows
- Whitewater™ Resource Toolkit for visually creating icons, dialogs, bitmaps and menu bars
- Turbo Profiler™ and Turbo Assembler®

Answer:

B O R L A N D

The Leader in Object-Oriented Programming

Compare these costs

	Microsoft® C 6.0	Borland C++
C compiler	\$ 495	\$495
C++ compiler	not available	included
Windows programming tools	\$ 495 (SDK)	included
Assembler	\$ 150	included
Total**	\$1,140	\$495

Buy now!

Get "Programming Windows" free!

Buy Borland C++ now from your local dealer and get a free copy of *Programming Windows* by Charles Petzold, the best-selling book about learning Windows programming.†

Special upgrade pricing is available from Borland for owners of Turbo C,* Turbo C® Professional, Turbo C++ and Turbo C++ Professional.

**See your dealer
today, or
call Borland to
upgrade at
1-800-331-0877**



BRIEFS



WINDOWS

Knowledge Garden is offering an interim upgrade of *KnowledgePro Windows* (\$695; free to registered users). Version 1.1 offers bug fixes and improved performance under *Windows 3.0*. 518-766-3000.

SLR Systems has released *Optlink/Windows* (\$350; upgrades, \$75), a segmented linker for DOS, *Windows*, and OS/2 .EXE files. Release 2.50 offers support for *CodeView 3.0/3.1*, compatibility with MS linkers for generating *Windows* and 16-bit OS/2 .EXE and .DLL files, and complete global cross-referencing. 412-282-0864.

Vinzant now offers a *Windows* version of *SQLFile* (\$495 per workstation; runtime five-pack, \$495). The package is compatible with Microsoft's *SQL Server*, Novell's *NetWare SQL*, and Oracle. 219-763-3881.

Nisca has added *Perceive*, a *Windows* scanning package from OCRON, to *Niscan/GS OCR for Windows* (\$599). This makes the product the first 256-gray-scale scanning, image-editing, paint, and OCR device. 214-242-9696.

SoftSource has announced *Drawing Librarian—Windows* (\$150), which ports its *AutoCAD* and .DXF file manipulation system and file viewers to *Windows 3.0*. This lets images be cut, pasted, and transferred to other *Windows* applications through the *Windows* clipboard. 800-626-0999 or 206-676-0999.



SPREADSHEETS

Intex Solutions has

upgraded its *Lotus 1-2-3*

trend-prediction package, *Forecast* (\$145; upgrade \$45), to take advantage of 1-2-3 3.1's WYSIWYG environment and advanced presentation features. 617-449-6222.

Lindo Systems now adds support for Borland's *Quattro Pro*, Release 2.0, and 1-2-3 3.1 to *What's Best!*, its spreadsheet optimization tool (\$149 to \$2,995 in various configurations of available variables). Also announced was *What's Best Extended* (\$4,995), which is capable of handling 32,000 variables. 312-871-2524.

1.3GB Intelligent Array Drives from Compaq

IMPROVED

Compaq offers nearly 20 gigabytes of storage with its Intelligent Array Expansion System. The unit provides 2.6GB of memory by using two 1.3GB drives with a 32-bit Intelligent Drive Array (IDA) and can be scaled up to 9.1GB. 19.88GB of fast storage becomes available for applications by filling the eight full-height expansion slots.

The drives can be addressed as one logical drive or, by using the features of the IDA controllers, can perform automatic duplexing or drive mirroring. The system is supported by Novell's *NetWare 386*.

List Price: Compaq Intelligent Array Expansion System, \$21,999; each additional 1.3GB drive, \$9,099; each additional IDA controller, \$2,999. **Requires:** Compaq Systempro. Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269-2000; 800-345-1518.

CIRCLE 436 ON READER SERVICE CARD

R:BASE Adds Dynamic Links to Other Apps

IMPROVED

R:BASE, Microrim's LAN-based database, has added user-configurable hooks for accessing other applications from its main menu screen. Dynamic Application Integration (DAI) lets you use the specialized functions of other packages such as *dBASE*, *Harvard Graphics*, or *WordPerfect* within *R:BASE*. Version 3.1a is the first in a series of regular upgrades available on a subscription basis to registered users. It includes speed enhancement to the query engine, report printer, and search functions; word wrap in the note and text areas; and interactive debugging support. **List Price:** *R:BASE*, Version 3.1A, \$99.

Upgrade Express program, \$129 yearly (includes three upgrades); LAN pack subscription, \$149 yearly; runtime versions, \$99. **Requires:** 640K RAM, DOS 3.1 or later. Microrim Inc., 15395 SE 30th Pl., Bellevue, WA 98007; 206-649-9500.

CIRCLE 437 ON READER SERVICE

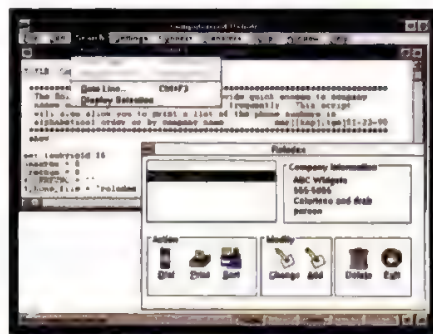
Terminal Emulator Runs Under Windows

IMPROVED

Future Soft Engineering has ported its asynchronous communications/terminal emulation package to *Windows 3.0* with *Dynacomm Asynchronous Edition*. The package's scripting language offers task automation and front-end customization of remote services. Programming capabilities include conditional and subroutine execution, event handling, and dynamic data exchange (DDE) to other *Windows* applications.

Dynacomm supports standard communi-

cations protocols as well as Ymodem and Zmodem. It provides DEC VT-100, VT-52, and VT-220, IBM 3101, and HP 700/94 terminal links, among others. Additional support is also provided for networks including NetBIOS, DEC LAT, and pooled modems.



Dynacomm's scripts let you build application-integrating terminal emulations.

List Price: *Dynacomm Asynchronous Edition*, Version 3.01, \$295. **Requires:** *Windows 3.0*. Future Soft Engineering Inc., 1001 S. Dairy Ashford, Houston, TX 77077; 713-496-9400.

CIRCLE 438 ON READER SERVICE CARD

Fax Board Adds Special Effects Printing

IMPROVED

3X USA's HP LaserJet emulation fax board, *Fax Like You Print (FLYP)* 96, adds text-merge capabilities with the release of the *Faxmerge* software. The \$125 program allows you to send mass fax mailings that take full advantage of your system's fonts, graphics, gray scaling, and text effects. **List Price:** *Faxmerge*, \$125. **Requires:** *FLYP 96* fax board. 3X USA, One Executive Dr., Fort Lee, NJ 07024; 201-592-6874.

CIRCLE 439 ON READER SERVICE CARD

TSR Development Kit Adds Clipboard

IMPROVED

VIA, a TSR (terminate and stay resident) development language from **Portable Computing Systems**, has released Version 2.0. The upgrade adds complete mouse support, password security at any level, a clipboard for data exchange, and access to data in any proprietary data formats. The program, which consists of an editor, compiler, and sample scripts, can be used to create TSR versions of existing programs and occupies less than 10K when used with LIM 4.0 standard expanded-memory protocols.

List Price: *VIA*, Version 2.0, \$149. **Requires:** DOS 2.1 or later. Portable Computing Systems Inc., P.O. Box 870755, Dallas, TX 75287; 800-749-4917.

CIRCLE 440 ON READER SERVICE CARD

Make a big change for small change.

If you're changing to Windows™, why not take a bigger step? Up to a new concept in Windows word processing. Professional Write® PLUS from Software Publishing Corporation.

Professional Write PLUS is the new Windows word processor specially designed for business professionals. The one that easily handles imported text and graphics from many sources. Updates figures automatically using DDE—even within text. And offers editable

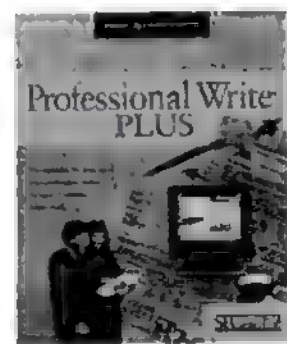
Trade up to a
new concept in Windows
word processing.

\$99

WYSIWYG page views. It also comes with an E-mail front end, as well as an integrated grammar checker that can add power to your prose.

And until June 30, 1991, you can trade up for just \$99* if you own a qualifying word processor.

SPC SOFTWARE
PUBLISHING
C--O--R--P--O--R--A--T--I--O--N



Discover Professional Write PLUS. Call 1-800-336-8360, Operator 502, for a participating dealer.

*To be eligible for the \$99 offer, you must provide proof of ownership of qualifying word processor. Special discounts for OfficeWriter and Professional Write owners. You may also obtain information to order directly by mail. Professional Write PLUS list price: \$249.00. Runs on Windows 3.0. Professional Write is a registered trademark of Software Publishing Corporation. Windows is a trademark of Microsoft Corporation. © 1991 Software Publishing Corporation, 1901 Landings Dr., Mountain View, CA 94039-7210.

Your logical next step...

- is to get ready-to-run software created for your**
- is to organize all your company's data in a cen**
- is to build an easy-to-use system that can grow**
- is to enhance the value of your existing PCs**
- is to control your total cost of computer system**
- is to choose a system that's renowned for quali**

kind of business

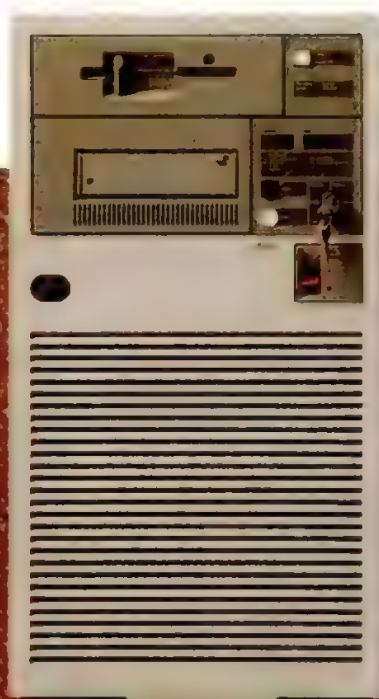
tral place

as you grow

ownership

ty and support

...is an IBM AS/400®



IBM®

*To learn more about
stepping up to an IBM AS/400,
call an IBM marketing rep.
Or, call us for the
44-page IBM AS/400
Solutions Catalog.
1 800 365-4 IBM, ext. 10*



The AS/400 Model C10 is just over 2 ft. tall.

SAME-DAY SHIPPING GETS YOU STARTED FASTER!



Solid Reputation! Above Average Service & Support!

"The ACMA 486/33 Engineering Workstation is a fairly priced system from a vendor with a solid reputation and above-average service and support policies. Acma tied for first place in Conventional Memory tests and "...earned the second-highest score on the Instruction Mix test."

Call For
GSA
Pricing!



286/12

- 80286/12MHz CPU
- 1MB RAM expandable to 4MB
- 1.2MB or 1.44MB floppy
- 40MB IDE hard drive (18ms)
- Monochrome monitor & Hercules compatible mono-graphics card
- 2 serial 1 parallel & 1 game port
- 101 enhanced keyboard
- MS-DOS 4.01
- MS-DOS & OS/2, Unix, Xenix, & Novell compatible

\$995

386/SX 16 & 20

- Intel 80386SX-16 or 20MHz CPU
- 4MB RAM expandable to 8MB on motherboard (1MB on SX-16MHz)
- 1.2MB & 1.44MB floppy drives
- 40MB IDE hard drive (18ms)
- 14" Super VGA color monitor (1024x768, .28 dot pitch)
- 16-bit VGA card with 512K RAM
- 2 serial, 1 parallel & 1 game port
- 101 enhanced keyboard
- Windows 3.0 & Mouse
- MS-DOS 4.01
- MS-DOS & OS/2, Unix, Xenix & Novell compatible

16MHz \$1,595

20MHz \$1,995

386/25

- Intel 80386/25MHz CPU
- 4MB RAM expandable to 8MB on motherboard
- 1.2MB & 1.44MB floppy drives
- 80MB IDE hard drive (19ms)
- 14" Super VGA color monitor (1024x768, .28 dot pitch)
- 16-bit VGA card with 1MB RAM & 256 colors at 1024x768
- 2 serial, 1 parallel & 1 game port
- 101 enhanced keyboard
- 1 year TRW on-site service
- Windows 3.0 & Mouse
- MS-DOS 4.01
- MS-DOS & OS/2, Unix, Xenix & Novell compatible

\$2,395

486EISA 25&33

- Intel 80486/25 or 33MHz CPU
- 4MB RAM expandable to 64MB on motherboard
- 256K Cache
- 1.2MB & 1.44MB floppy drives
- 150MB ESDI hard drive (18ms)
- ESDI/EISA controller
- 14" Super VGA color monitor (1024x768, .28 dot pitch)
- 16-bit VGA card with 1MB RAM & 256 colors at 1024x768
- Built-in math coprocessor & Weitek 4167 support
- 2 serial, 1 parallel, 1 game port
- 101 enhanced keyboard
- 1 year TRW on-site service
- Windows 3.0 & Mouse
- MS-DOS 4.01
- MS-DOS & OS/2, Unix, Xenix & Novell compatible

25MHz \$5,195

33MHz \$5,995

486ISA 25&33

- Intel 80486/25 or 33MHz CPU
- 4MB RAM expandable to 16MB on motherboard
- Cache: 33MHz-256K, 25MHz-64K
- 1.2MB & 1.44MB floppy drives
- 210MB IDE hard drive (18ms)
- 14" Super VGA color monitor (1024x768, .28 dot pitch)
- 16-bit VGA card with 1MB RAM & 256 colors at 1025x768
- Built-in math coprocessor & Weitek 4167 support
- 2 serial, 1 parallel & 1 game port
- 101 enhanced keyboard
- 1 year TRW on-site service
- Windows 3.0 & Mouse
- MS-DOS 4.01
- MS-DOS & OS/2, Unix, Xenix & Novell compatible

25MHz \$3,595

33MHz \$4,350

386/33

- Intel 80386/33MHz CPU
- 4MB RAM expandable to 8MB on motherboard
- 64K Cache
- 1.2MB & 1.44MB floppy drives
- 80MB IDE hard drive (19ms)
- 14" Super VGA color monitor (1024x768, .28 dot pitch)
- 16-bit VGA card with 1MB RAM & 256 colors at 1024x768
- 2 serial, 1 parallel & 1 game port
- 101 enhanced keyboard
- 1 year TRW on-site service
- Windows 3.0 & Mouse
- MS-DOS 4.01
- MS-DOS & OS/2, Unix, Xenix & Novell compatible

\$2,595



FEATURES & SERVICES

- 45-Day money-back guarantee.
- **FREE** Microsoft® Windows™ 3.0 & Mouse with 386 & 486 systems.
- **FREE** Microsoft® DOS 4.01
- Windows and/or DOS preloaded for you!
- Same-day shipping for standard (as listed) configurations ordered before 2pm EST.
- **FREE** 1 year TRW on-site service for 386 & 486 computers in most U.S. locations.
- **FREE** lifetime toll-free technical support.
- Leasing available for qualified businesses.
- New longer hours: 8am-10pm M-F & 11am-7pm Saturdays EST.
- Hearing impaired TDD 800-456-8901
- Call for GSA Pricing!

**BEST
BUY!**

100% Satisfaction Guaranteed!
Call Toll-Free 800-456-1818

New Longer Hours: 8am-10pm M-F & 11am-7pm Sat. (Eastern Time)

COMPUTERS, INC.
Acma



Always The Best Quality And Value!

All prices and specifications are subject to change without notice. 117 Fourier Avenue, Fremont, CA 94539 (415) 623-1212 (415) 623-0818 Fax

edited by
Matthew J. Ross

Read Only

Reviews of the Latest Books for the PC User

The Programmer's Bookshelf

■ Undocumented DOS:

A Programmer's Guide to Reserved MS-DOS Functions and Data Structures.

by Andrew Schulman, Raymond J. Michels, Jim Kyle, Tim Paterson, David Maxey, and Ralf Brown.

Addison Wesley, \$39.95.

Until now, the authors of TSRs, network drivers, command line processors, and debuggers have existed in a programming limbo, dependent upon DOS programming interfaces that Microsoft has steadfastly refused to document and support. Consequently, these developers have been forced to use other, inherently inefficient sources of information: source listings handed down from more-experienced programmers, bulletin board folklore, sporadic leaks from Microsoft, and ultimately, that weapon of last resort—the disassembler.

Undocumented DOS marks an important turning point for DOS programming: It collects and systematizes virtually everything that is known about DOS programming beyond the limits sanctioned by Microsoft. The undocumented facets of MS-DOS have now been documented, without Microsoft's help, to a depth that should satisfy the programming community for several years to come.

The book's lineup of authors is impressive, including Andrew Schulman, one of the finest technical writers in our field today; Tim Paterson, creator of Seattle Computer's 86-DOS (the progenitor of MS-DOS 1.0); Jim Kyle, responsible for Que's *DOS Programmer's Guide*.

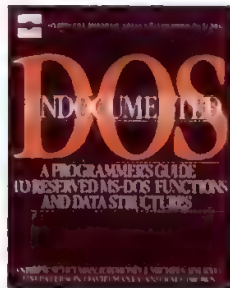
Undocumented DOS opens

with two excellent essays by Schulman describing the tradeoffs of undocumented functions, the rationale for using them, and conservative strategies to do so safely. Massive chapters on MS-DOS resource management, the FAT file system, network redirector interface, memory-resident software, and command interpreters follow, as well as shorter chapters on the MS-DOS debugger interface and other topics. Detailed programming examples are provided, and the last 200 pages of the 695-page book hold a function-by-function reference to all undocumented DOS services and an annotated bibliography.

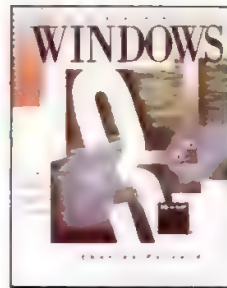
Undocumented DOS contains two 5.25-inch 1.2MB disks that include a hypertext-like reference to all the MS-DOS functions, source code from the book, executable versions of the example programs, and several bonuses. The first and most interesting bonus is the INTRSPY utility, which is a script-controlled, event-driven debugger of marvelous versatility. Complete source code for two command line debuggers by Tim Paterson, MONITOR and WINMON, is also included.

Only one or two books per year stand out as truly worthwhile efforts that we can use every day. *Undocumented DOS* is such a book. Serious DOS programmers should own a copy.—**Ray Duncan**
Addison Wesley Publishing Co., Inc.,
Reading, MA 01867; 617-944-3700.
ISBN 0-201-57064-5.

CIRCLE 306 ON READER SERVICE CARD



These two new books deserve a space on every programmer's bookshelf.



■ Programming Windows, Second Edition

by Charles Petzold

Microsoft Press, \$29.95

When the first edition of *Programming Windows* appeared in 1988, it was hailed as a classic. Any time the question was asked, "What do I need to program for Windows?" the answer was, "You need the Microsoft C compiler, the SDK, and *Programming Windows*." With *Programming Windows*, Second Edition, Charles Petzold has some very large shoes to fill. Fortunately, they are his own.

The bad news is that the new edition is an updated version of the original, and not *Programming Windows*, Volume 2. The good news is that the 944-page upgrade is significant. Petzold demonstrates why he is one of the best writers on the subject.

Though the structure of the book is unchanged, section names have been altered slightly. The five sections are now called Getting Started, Reading Input, Using Resources, The Graphics Device Interface, and Data Exchange and Links. The 19 chapters these sections encompass will lead a novice

Windows programmer in even, well-paced steps from the basic *Windows* programming concepts through the complicated topics of dynamic data exchange and dynamic link libraries.

What is new to the Second Edition? There are two new chapters entitled "Dynamic Data Exchange (DDE)" and "The Multiple Document

Interface (MDI)," and the two arrive just in time. DDE is so complicated that we need someone like Petzold to do what can be done to demystify it, while MDI has become an essential part of the *Windows* 3.0 environment. All of the source code has been rewritten to reflect the clearer coding style possible with the recent versions of the Microsoft C compiler. Finally, Section I, formerly Basic Concepts, is now Getting Started. Less time is spent explaining the GUI philosophy, and more time getting a programmer up to speed.

Petzold's work is by no means perfect. There are omissions. Chief among them are any discussions of the palette manager and the new help system. Still, Petzold's faults are few, and largely result from the formidable expectations of *Windows* programmers like myself.

Do you need the new Petzold? If you have been working with *Windows* for a while, you don't need *Programming Windows*, Second Edition; you deserve it.—**Rick Ayre**

Microsoft Press, Redmond, WA
98052; (800) MS-PRESS.
ISBN: 1-55615-264-7

CIRCLE 307 ON READER SERVICE CARD

**WE BRING
THE HIGH COST
OF NEW-TECH
DOWN FAST.**

Every time some hot new CPU comes along, up pops a host of new monitors to go with it. Expensive ones.

Then in a couple of years, prices come down. Way down. You know the cycle.

At Samtron, we specialize in speeding up this process.

Our Sedai design team takes the latest monitor technology and refines it. Designs it for easy production as well as high performance and reliability.

And since we are the world's largest CRT manufacturer, we're able to produce most of it in our own facilities. Which brings costs down even more.

That's how we can offer you color monitors to go with whatever you have that's new. Be it PC or PC/AT or IBM 8514 or MAC II. At prices that are way ahead of their time.

New Super Series has .31 or .28 dot pitch, and 800 x 600 or 1024 x 768 resolutions. Even 8514/MAC II compatibility.



SAMTRON
WE'RE WORTH WATCHING

CIRCLE 206 ON READER SERVICE CARD

14251 E. FIRESTONE BLVD., SUITE 101, LA MIRADA, CA 90638 (213) 802-8425

by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

RAMDACs and XGA Spec Compete to Set the Next Video Graphics Standard

It used to be that IBM set the video standards, choosing the time and the specs.

Almost four years have passed since IBM created its last successful video standard—VGA—and there are signs that even IBM is starting to flounder without a clear sense of future video directions. Graphics software from IBM and everyone else needs to use more than VGA's 16 and Super VGA's 256 colors.

IBM tried to ignore the success of boards that added 256 color modes to VGA, instead

sticking with 8514 and XGA.

Recently, the company gave hints that it would like to license the XGA chip set to third parties. But then it backed away from that position.

XGA is facing a market that's far more mature than it was in 1987 and IBM can't call the shots the way it once did.

The success of Super VGA did more than simply hurt 8514 and XGA; it led video board makers to band together into a group called VESA that meets regularly to help protect and nurture the SVGA specifications.

Those SVGA vendors are now looking to take control of their future and they have a number of enticing technologies that build on rather than replace today's SVGA architecture.

The two leading technologies are RAMDACs with new color palettes that would require only minor changes to SVGA board designs. Unlike the Edsun Continuous Edge Graphics RAMDACs that were introduced last year (and met with resistance from board makers), these RAMDACs would be relatively easy for software programmers to access. (The RAMDAC converts digital software instructions into analog color signals that control the mix of colors displayed on-screen.)

The first new RAMDAC is from Sierra Electronics; it's

called HiColor and generates 32K colors using an algorithm that takes the VGA's 8-bit palette and converts it to 16 bits of color information. It has been circulated among developers for months, and the first products should be out within weeks.

The second RAMDAC was created by Radius; it generates 16 million colors by translating VGA instructions to 24-bit color. The first implementation should be available from Brooktree, the company that makes many of the RAMDACs in current SVGA boards. It won't be ready for a few months more.

Unlike XGA, these chips will *not* improve video performance; they have the potential of reducing performance, but the RAMDAC makers believe that it will

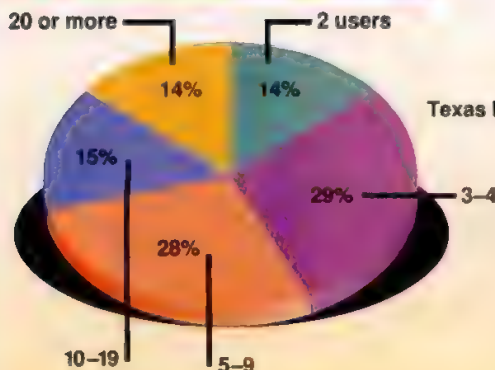
CONTINUES ON PAGE 69



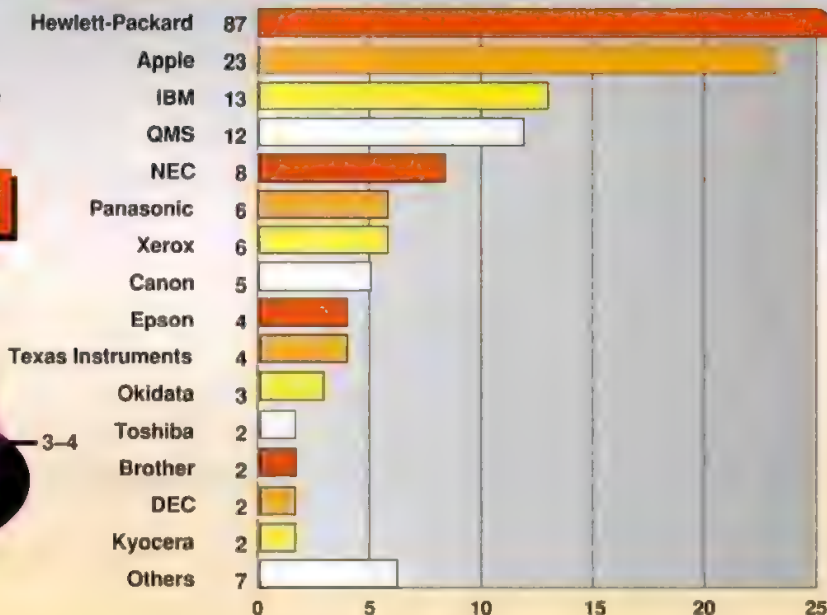
MAGNET SURVEY

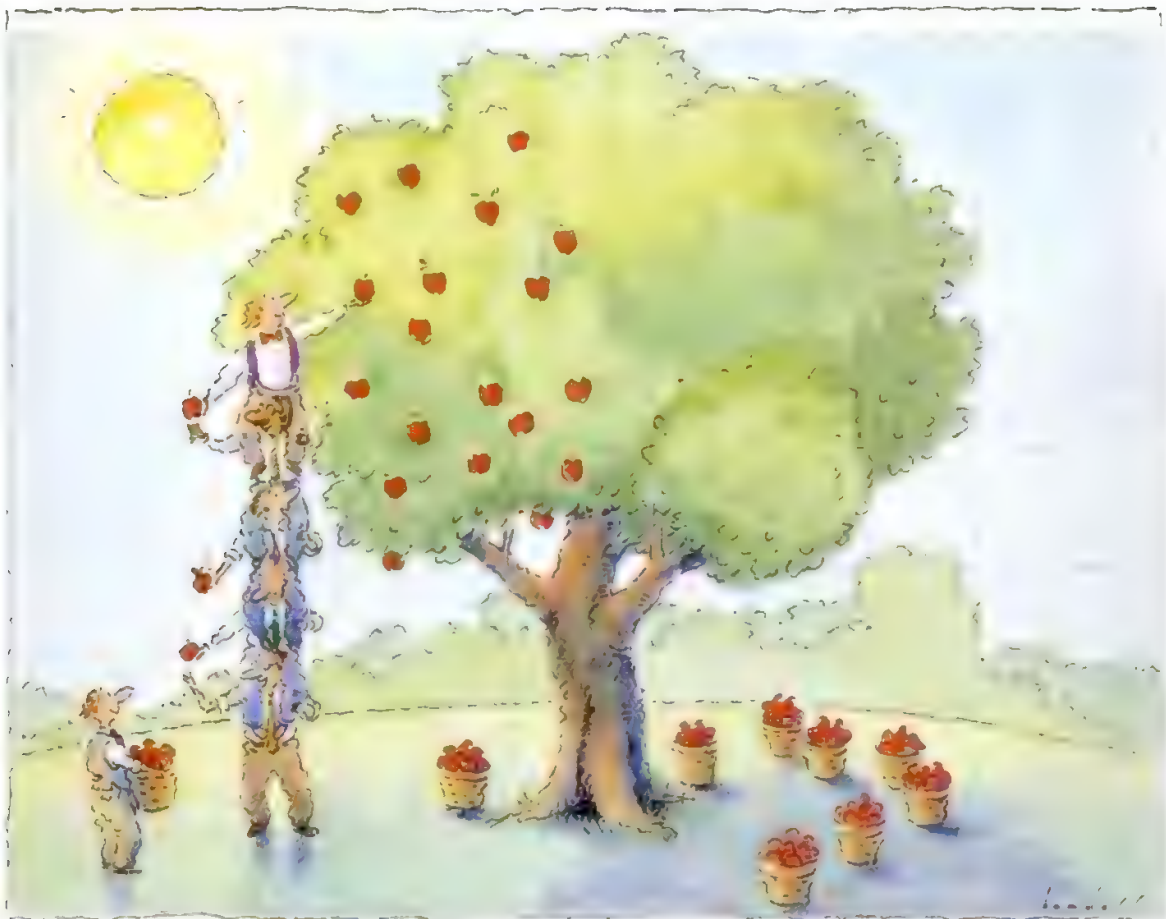
When we asked 1,800 callers to PC MagNet about printers, 95 percent said that laser printers are being used in their office. 72 percent of the respondents said that the laser printer they use is being shared; we asked this group to tell us how many people share their printer.

How many users share the laser printer you use most often?



Which of these laser printer brands are used at your company?





Put Primavera multiuser to work. And see an instant improvement in team performance.

Large projects demand more than an assembled project team. *Teamwork* is what makes things happen.

That's the essential idea behind the multiuser capabilities of Primavera Project Planner®. Unlike many "multiuser" project management packages, Primavera offers *simultaneous* access to project files—and allows *simultaneous* generation of reports and graphics. The project team gets more done because team members aren't waiting in line for computer time.

Everything needed to plan and execute your project is included in the software: lightning-fast scheduling, resource management, cost control, reporting and graphics. Special features simplify coordination, communication and cooperative control by the team.

Primavera's record-locking design protects activity data. Project access levels are password-protected too.

Frequent interaction among team members is made easy with the software's own electronic mail system. You don't have to exit Primavera to leave a message for an associate or check the internal project bulletin board.

What's more, every Primavera Project Planner package lets you choose single user or multiuser functionality for your Novell, 3Com or Banyan network. You can grow into a multiuser environment without any cost penalty.

Call **1-800-423-0245** for a free video preview of the software. Or, ask for a personal demonstration—and see firsthand how Primavera can help pull a project team together.



PRIMAVERA

*How the world says
project management*

Two Bala Plaza • Bala Cynwyd, PA 19004 • (215) 667-8600 • Fax: (215) 667-7894

CIRCLE 148 ON READER SERVICE CARD

Pipeline

CONTINUED FROM PAGE 67

be so minor that users won't notice. And these chips should prove to be inexpensive enhancements, because they won't require more memory.

Even though Sierra's HiColor has a smaller color palette, it may have an advantage over Radius' because it will be compatible with Targa software.

Unfortunately, there's likely to be a lot of confusion before a clear standard emerges. Most board makers are torn; they have plans for enhancing SVGA designs but are looking over their shoulders at what their competitors are planning without great confidence that they've made the right choice.

They tend to believe users would rather see extensive color, instead of XGA's higher resolution—but they're not sure.

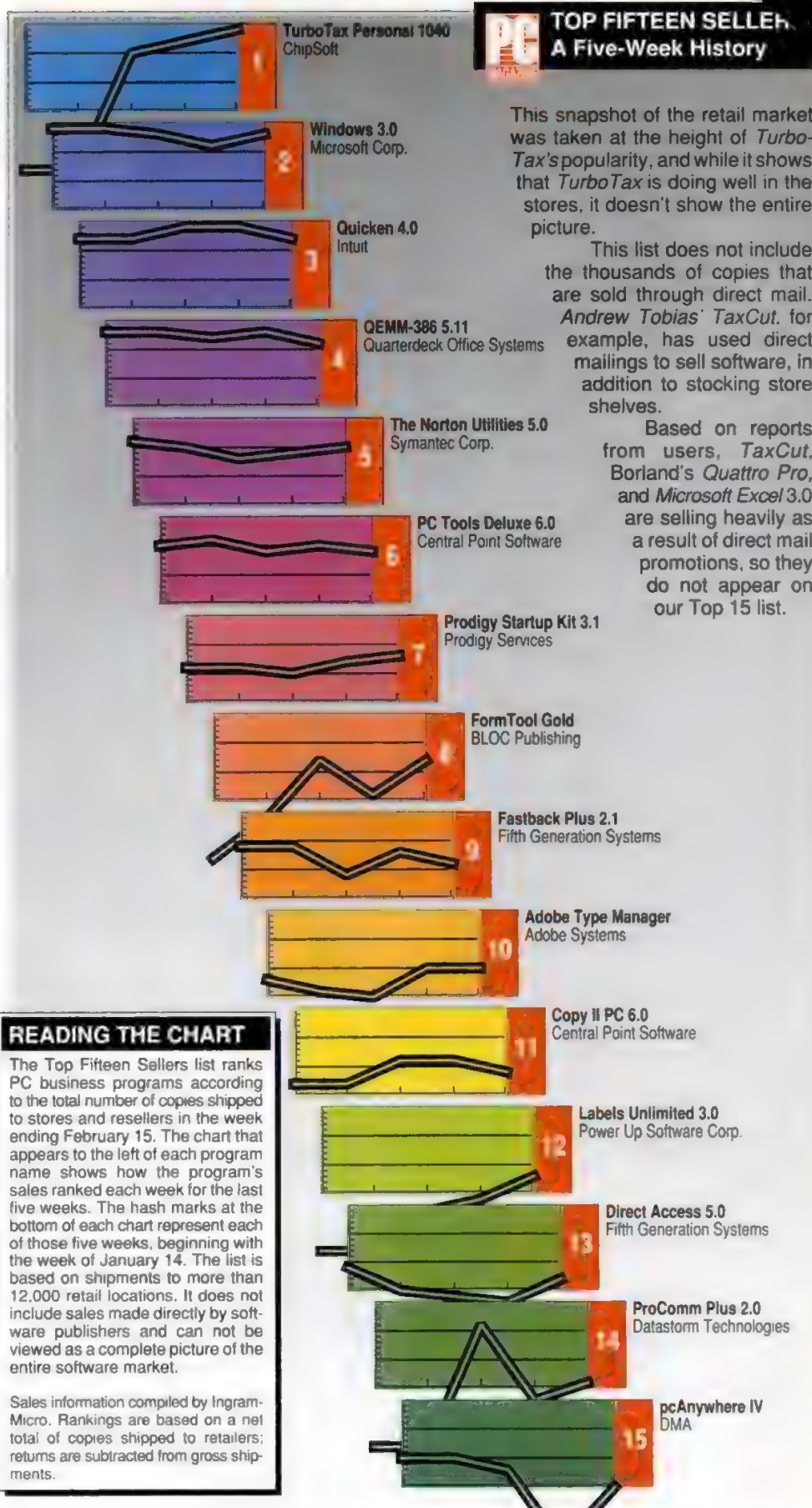
So look for a lot of high-color Super SVGA boards with Windows drivers soon.

Compaq Establishes Its First Free Support Line

The changes expected at Compaq (see Pipeline, March 26, 1991) seem to be underway. The company has set up its first ever direct-support operation. Callers can get answers to simple questions concerning unit setup, problem identification, Compaq's operating systems, and BASIC. The number is 800-345-1518.

In addition, a technical support line was established to help diagnose more-involved problems—at a price. The Compaq Telephone Support Agreement costs \$3,000 and will provide help in resolving compatibility problems between Compaq products and operating systems from Novell, Banyan, SCO, and Microsoft. Subscribers will also receive a CD-ROM database of Compaq technical service documents. The service contract can be purchased through Compaq dealers.

When *PC Magazine* surveyed readers on service and reliability last year, one of the biggest complaints was Compaq's refusal to answer questions from customers.



This snapshot of the retail market was taken at the height of *TurboTax*'s popularity, and while it shows that *TurboTax* is doing well in the stores, it doesn't show the entire picture.

This list does not include the thousands of copies that are sold through direct mail. *Andrew Tobias' TaxCut*, for example, has used direct mailings to sell software, in addition to stocking store shelves.

Based on reports from users, *TaxCut*, Borland's *Quattro Pro*, and *Microsoft Excel 3.0* are selling heavily as a result of direct mail promotions, so they do not appear on our Top 15 list.

Serving the
computer world
since 1984

CompUSER

COMPUDYNE 286-16



80286, 16MHz
1MB, 0 wait state
1.2 MB 5¼" Drive
IDE HD controller
101 keyboard
8 expansion slots

\$459

1-year warranty
12" Amber 720x350
14" VGA Color .41 dp 640x480

40MB 28ms	\$799	\$1019
69MB 19ms	\$939	\$1159
124MB 19ms	\$1039	\$1259
211MB 15ms	\$1299	\$1519

Video Card Included! Fully Tested!

COMPUDYNE 386SX-16



80386SX, 16MHz
1MB, 0 wait state
1.2 MB 5¼" Drive
IDE HD controller
101 keyboard
7 expansion slots

\$629

1-year warranty
12" Amber 720x350
14" VGA Color .41 dp 640x480

40MB 28ms	\$969	\$1189
69MB 19ms	\$1109	\$1329
124MB 19ms	\$1209	\$1439
211MB 15ms	\$1469	\$1689

Video Card Included! Fully Tested!

COMPUDYNE 386-25C



80386, 25MHz
1 MB, 32K cache
1.2 MB 5¼" Drive
IDE HD controller
101 keyboard
7 expansion slots

\$1059

1-year warranty
12" VGA White 640x480
14" VGA Color .41 dp 640x480

40MB 28ms	\$1489	\$1619
69MB 19ms	\$1629	\$1759
124MB 19ms	\$1729	\$1859
211MB 15ms	\$1989	\$2119

Video Card Included! Fully Tested!

286/12 System

Graphics Cards

Printers With Free Cables!

Leading TECHNOLOGY 286-12



80286, 12MHz, 1MB RAM, 5¼" and 3½" drives, 40 MB hard drive, Mouse, DOS, .52 VGA color monitor and card, 2400 bps modem, Prodigy, 1 year on-site warranty, (no substitutions)

\$995

Compudyne VGA 640 x 480	\$65
VGA 1024 x 768	\$89
ATI BasicVGA 16	\$75
VGA Wonder 256 Plus	\$179
Sigma VGALegend	\$239
Suntek MGP III Mono	\$25
Leading Tech CGA Color	\$25

Storage Devices



Seagate 157ADrive

40MB storage
28ms access
3½" drive
IDE

\$225

Seagate ST157A Drive Only ..	\$219
ST1102A 89MB IDE	\$359
ST1144A 124MB IDE	\$459
ST1239A 211MB IDE	\$719
Plus Development 80 MB	
Hardcard II	\$459
150 MB Hardcard II	\$609
Quantum/Impulse LP 105	
100MB AT	\$459
LP 210 200MB AT	\$749
SC 210 200MB SCSI	\$729

Floppy Drives

Compudyne 5¼" ext.	\$199
Sony 3½" 720K	\$55
3½" 1.44MB	\$62
Toshiba 5¼" 1.2MB	\$62

Tape Backups

Compudyne 60MB Int	\$229
120MB Int.	\$319

Canon BJ10e Bubblejet	\$299
Epson LX810 9-pin	\$169
LQ510 24-pin 80 col.	\$259
LQ1010 24-pin 132 col.	\$369
LQ2550	\$869
NEC P3200 24-pin 80 col.	\$259
P3300 24-pin 136 col.	\$369
Panasonic KX-P1180	\$147
KX-P1124 24 pin 80 col.	\$255
KX-P1624 24 pin 136 col.	\$349
KX-P1123	\$235
TI microLaser PS17	\$1199
MicroLaser PS35	\$1499
Seiko Label Printer	\$159

Joysticks

C&H Flight Stick	\$39
Quikshot Gamecard	\$12
QS123	\$10

Mice/Trackballs



Serial Mouseman

High resolution mouse
with 3-button functionality.
Windows 3.0
compatible!

\$62

Chicony 5581 101 w/Trackball ..	\$69
Logitech Trackman Serial	\$75
Marstek Serial Mouse E22	\$19
Microsoft Serial Mouse	\$79
Serial Mouse/Win.	\$145
Omi Mouse II w/paint	\$35

Monitors

Compudyne 14/800
14" VGA Color
.31 DP
800x600 **\$289**



Compudyne 14/1024V 14"1024x768, .28DP	\$339
Compudyne 14/640V 14" 640x480, .39DP	\$259
LTI 12" mono	\$69
1460A VGA mono 14"	\$115
NEC Multisync 3D VGA	\$619
Sony 1304 VGA 1024x768	\$629

CompUSER, Inc.

15151A Surveyor Addison, TX 75244

1-214-702-0055

1-800-932-2667

FAX (214) 702-0300

No Credit Card Surcharge!



Hours of operation (CST):

Monday - Friday 8am - 7pm

Saturday 9am - 2pm

Guaranteed Satisfaction!

If you find a current lower advertised price in this publication, we will beat that price, guaranteed! Competitor must have stock. Competitors shipping charges and surcharges will be calculated. Must be exact item. No-Questions-asked 30-day money back guarantee on hardware. Money back guarantee does

To Order Call 1-800-932-COMP (800-932-2667)

We will beat any published price in this magazine...Guaranteed!

COMPU DYNE 386-33C



1-year
warranty



80386,33MHz
1MB, 32K cache
1.2 MB 5¼" Drive
IDE HD controller
101 keyboard
7 expansion slots

\$1349

12"VGA White 14" VGA Color 14" VGA color
640x480 .41dp 640x480 .31dp 800x600

40MB 28ms	\$1789	\$1949	\$1989
89MB 19ms	\$1939	\$2089	\$2139
124MB 19ms	\$2029	\$2189	\$2229
211MB 15ms	\$2349	\$2509	\$2559

Video Card Included! Fully Tested!

Arima

ACT
286-410



12MHz 80C286
VGA display
Keybd detaches
40MB 27 ms HD
1.44 MB floppy
\$1799

TEXAS
INSTRUMENTS

TravelMate
2000

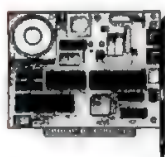


only 4.4 lbs!
12MHz 802C86
VGA Display
20MB 23 ms HD
\$1949

Toshiba Laptops All Models..... Call
Arima SX 2M, 40MB VGA \$2339
Megahertz T224 2400bps modem \$129
Compudyne 1.2MB ext. drive \$179
Laptop bags/modems Lowest Prices

Boards/Scanners

COMPU DYNE 2400i



2400 baud
Internal modem
Viscom software
\$55

Complete Answering Machine \$219
Communicator \$379
Creative Labs SoundBaster \$149
Logitech Scanman GS 256 \$269
Niscan GS Hand Scanner \$189
Mouse System PageBrush/32 \$139

Software



Arts & Letters

A dynamic design
tool for business
graphics and
desktop publishing
\$369

Word Processing

Grammatik IV / Windows \$46
Microsoft Word for Windows \$279
PFS: Pro Write 2.2 \$149
RightWriter 4.0 \$50
WordPerfect 5.1 \$239

Spreadsheet

Lotus 1-2-3 2.2 \$319
Microsoft Excel 3.0/ Windows \$289
PFS: First Choice 3.1 \$91
Quattro Pro \$299
Lotus 123 3.1 \$379

CompUSER carries over 300+ Titles

Windows

Adobe Type Manager/Win \$56
Current \$199
Grammatik IV/Win \$46
HDC First Apps/Win \$46
Windows Express 3.0 \$46
Microsoft Powerpoint/Win \$279
Project/Win \$399
Excel/Win 3.0 \$289
Word/Win \$279
Productivity Pack \$36
Read Right Pro \$139
Xerox Ventura Publisher/Win \$499

Miscellaneous

D.R. DOS 5.0 \$125
Form Filler (dual media) \$77
Form Tools Gold \$52
Microsoft Works \$88
Quick Schedule Plus \$52
Top Priority \$51

Graphics

Corel Draw 2.0 \$359
Express Publisher 2.0 (dual media) \$82
Harvard Graphics 2.3 \$275
PageMaker 4.0 \$469
PC Paintbrush IV Plus \$99
Xerox Ventura Pub. 3.0 / Windows \$499

Business/Accounting

DAC Accounting 4.1 \$76
Pacioli 2000 \$27
Peachtree Complete III \$136
Quicken 4.0 \$34
Timeline Project Manager \$419
Timeslips III \$155

Databases

Alpha IV \$279
PC File Plus 5.01 \$78
Paradox 3.5 \$489
Q & A Version 3.0 \$209

Languages

Microsoft C 6.0 \$289

Microsoft QuickBasic \$59
Turbo C++ \$125

Accessories/Utilities

386Max 5.0 \$69
Above Disc 4.0 \$55
Act! 2.0 \$205
Avery LabelPro \$41
Compuserve Starter Kit \$19
DesqView 2.3 \$67
Direct Access 5.0 (dual media) \$58
FastBack Plus 2.1 \$94
Headroom V2.02 \$66
Microsoft Windows 3.0 \$85
Norton Commander 3.0 \$89
Norton Utilities 5.0 \$109
Optune \$42
Org Plus Advanced 5.0 \$57
PC Tools 6.0 \$79
QEMM 386 5.1 \$52
Resume Maker \$26
Spinrite II \$59
System Sleuth \$69
WinSleuth \$69

Communications

Laplink III \$84
PC Anywhere IV \$89
Prodigy 3.1 \$23
Procomm+ 2.0 \$59

Education/Games

BattleChess (dual media) \$27
Chessmaster 2100 \$29
F-19 Stealth Fighter \$37
Falcon AT \$29
Grand Slam Bridge \$18
Leisure Suit Larry \$22
Math Blaster Plus \$27
Math Rabbit \$20
Microsoft Entertainment Pack \$25
PC Globe + \$35
Playroom \$24
Sim City \$27

not include shipping.

All returns must be in "as new" condition, w/
original packaging, w/o modifications or damage.
Returns require an RMA (Return Merchandise
Authorization) Number.

Defective Software exchanged for same item
only. Defective hardware repaired or replaced at

CompUSER's discretion.

Most orders placed before 2pm Central Time
will be shipped same day. COD, Visa, Master-
card, Discover, Checks and Cashier Checks
accepted. Texas residents add sales tax.
Freight charges - min. \$6/order UPS Ground.
Air freight: 1-5 lbs. \$8; 6-10 lbs. \$11; 11-15 lbs.

\$15. Call for overnight freight charges. Not
responsible for typographical errors, errors in
photography, or errors of omission. Prices and
availability subject to change. Due to changing
market conditions, call us toll free for current
pricing and availability. Domestic orders only.

Company purchase orders accepted upon credit approval.

Corporate Purchase Orders Welcome!



HEAVY PROBLEMS ARE BEST HANDLED BY PEOPLE THAT CAN MAKE LIGHT OF THEM.



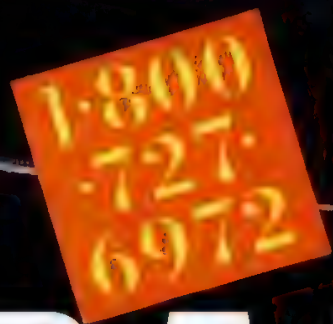
Today's business-computer users face a myriad of problems. Cost accounting and business analysis. Computer-aided design. Management of corporate data. Production of presentation materials. And work-group networking.

The Hyundai® 386 Series personal computers have the power to make light work of the heaviest problems.

From the 16 MHz Super-386S to the 33 MHz Super-386T, Hyundai offers four MS-DOS®, Windows™ and OS/2® compatible desktop computers designed to meet the needs of even the most demanding business user.

Hyundai's 386 Series computers—configurable to meet the needs of any business application—have earned an outstanding reputation as high-quality computer systems. A reputation that's backed by an eighteen-month warranty, a hand-picked nationwide network of dealers, and an optional 24-hour "Service-on-Site" program.

The 386 Series from Hyundai is the high-value solution. And the best way to make light of heavy problems. Hyundai Electronics America, 166 Baypointe Parkway, San Jose, California 95134.



HYUNDAI
INFORMATION SYSTEMS

Network Views.

Boundaries disappear with pcANYWHERE IV/LAN networked remote computing.



Adding to the power of your LAN has never been easier. With pcANYWHERE IV/LAN you can tune into other workstations as easily as flipping channels on your TV. Everyone will be craning their neck to see what's going on! Individuals, departments and companies use pcANYWHERE IV/LAN to work together – electronically. Bi-directional file transfers speed information back and forth. The ability to control one PC from another adds flexibility and extends everyone's reach. Department heads can collaborate across the LAN to access and exchange vital information in the budget process.

With pcANYWHERE IV/LAN critical training and technical support is available across your network: If a new user locks up a spreadsheet, Training can take over and fix the problem. To provide support, technical people can go from floor to floor, or town to town, without ever leaving their chairs. pcANYWHERE IV/LAN crosses boundaries to your remote offices as well, by including remote access through modems, communications servers, or the built-in gateway. Start saving time and money with pcANYWHERE IV/LAN. To see what it can do for you, call DMA today.



Enhanced Performance Remote Computing
1776 East Jericho Turnpike, Huntington, NY 11743
(516) 462-0440

CIRCLE 332 ON READER SERVICE CARD

Bill Machrone



Pen-Based Computing: Get the Point?

Although pen-based computers are in their infancy, it's not too early to begin thinking about their role.

The first crop of pen-based computers will be a lot like the first generation of laptops. They're a good indicator of where the future of pen-based computing is going, but they're clearly the beginning of the journey. Over the next couple of years, we'll see the same dizzying changes that marked the evolution of laptops. Pen-based machines are starting at notebook size and will progress from there. They can be smaller than notebooks because a keyboard is a form of ergonomic tyranny, dictating the overall shape and minimum size of the machine. Pen-based machines will start from flat, tablet, or portfolio designs and will progress down to pocket calendar size.

Pen-based computing brings the very way we compute into play. It presupposes a graphical user interface, and invites a complete redesign of virtually every application, from word processing to programming. Ergonomics experts talk breathlessly

about noun-verb versus verb-noun metaphors, and they get positively ecstatic over terms like "modelessness." Modelessness is a good thing, and pen-based interfaces have it.

In a noun-verb construct, you select an object, then do something to it. In the verb-noun construct, you pick an action, then choose the object to be acted upon. In a modeless interface, you select an object and an action simultaneously. For example, with a noun-verb interface, you would highlight a word with your cursor or a mouse, then press the appropriate keys to delete it. In a verb-noun environment you would select the delete function, then tell it what to delete. In a modeless environment, you simply draw an X through the word and it goes away.

Pen-based interfaces are refreshing in their directness. You don't have to learn new feats of coordination, as you do with a mouse. Have you ever watched a newcomer to mice get further and further from the keyboard because he hasn't figured out how to pick up the mouse and reposition it? How often do you overshoot

your target? What about those mysterious skips when the cursor suddenly jumps halfway down the screen? You thought it was just you? Nope, it happens to everybody. No such problem with pens. You point at the object of your intentions, and unless you suffer from Saint Vitus' dance, you get it. This is where pen interfaces excel.

The real stumbling block for pen-based systems is handwriting recognition. They're amazingly good, but not good enough. You can train them, but you can't teach them. They'll learn your normal handwriting, but are apt to get lost if you switch to a more relaxed style. I take notes in a style I call "connected printing." So far, it's befuddled every handwriting recognition program I've tried.

Advocates of pen-based systems point to the huge numbers of white-collar jobs that remain uncomputerized. They feel that the keyboard remains a barrier to many. Let's face it: If you haven't learned to type, you've made a decision to leave yourself out of the information revolution. No matter how good pen-based systems get, they'll never replace the keyboard for fast, accurate entry of words and numbers. Voice recognition is the only technology with the potential to out-



ILLUSTRATION: NED SHAW

speed the keyboard, yet it has considerable drawbacks. Just think of yourself and a roomful of your peers at some future department meeting, all muttering into your computers.

ANTISOCIAL COMPUTING

Purveyors of pen systems make much of the unsociability of using laptop computers in business situations. They talk of the barrier formed by the raised screen and of the gaffe of

AMERICA'S MOST POPULAR GRAPHICS FORMS SOFTWARE NOW AT A NEW LOW PRICE



For a limited time only, we're cutting the price of PerFORM 2.1 in half - \$149* (\$175* in Canada). PerFORM 2.1 Designer & Filler saves you time, money and effort in managing business forms.

TAKE THE DRUDGE OUT OF ROUTINE BUSINESS FORMS

PerFORM 2.1 leads the pack in PC forms processing. Design your own forms quickly and easily on your PC instead of sending out. Fill in your forms on-screen instead of by hand. Save filled data in your database. Print only what you need instead of ordering thousands at a time.

WYSIWYG vs. GOBBLEDEGOOK

Some PC forms packages sell for peanuts. And that's exactly what they give you: a gobbledegook screen display that can drive you nutty. With PerFORM, what you see is what you get: great looking forms - fast!

Unlike low-end forms utilities that only give you WYSIWYG preview, PerFORM 2.1 is *completely* WYSIWYG, so what you see is what you print. Clear, crisp graphics. Your form appears on your screen the same as the final printed version - eye-catching and easy-to-read. Bitstream fonts and over 100 ready-to-use forms templates are included to get you going right away.

PerFORMANCE AND PRICE

New version 2.1 of PerFORM has the power and features of more expensive forms packages, yet costs only \$149* during this limited-time promotion. Whether you use an old IBM-XT compatible, a brand new '486 or anything in between, PerFORM 2.1 makes the most of your hardware to give you high quality forms. And your forms are fully compatible if you move to PerFORM PRO in the future.

THE CRITICS' CHOICE

In just two years, PerFORM has won the accolades of the editors and the loyalty of thousands of users worldwide. The winner of the major media awards, PerFORM Designer & Filler is recognized as the industry leader in PC forms processing.

FORM YOUR OWN OPINION

Why just believe the critics? Form your own opinion. You can now own the leading PC forms software at a bargain utility price. What's more, new PerFORM 2.1 comes with a **no-risk 60-day money back guarantee**. Hurry! This low price offer won't last long!

CALL TODAY FOR A DEALER NEAR YOU!

1-800-268-6082



PerFORM

PerFORM and PerFORM Designer & Filler are trademarks of Delrina Technology Inc. (c) 1990. Other products are registered trademarks or trade names of their respective owners.

CIRCLE 250 ON READER SERVICE CARD

Bill Machrone

typing while someone else is talking and how flat, pen-based systems solve these problems because they extend the already acceptable metaphor of writing on a pad. Maybe they do, but I've been carrying a laptop to meetings for years, sometimes for taking notes, but more often to look up e-mail correspondence or other reference materials. Perhaps I travel in exceptionally nerdy circles, but no one has ever given me the hairy eyeball for using it.

There's another barrier to widespread acceptance of pen-based machines: the LCD panel. LCDs have come a long way in terms of resolution, brightness, and clarity, but it'll be years before they can compete with the good old CRT for color at an affordable price. Even then, it'll take a technological miracle to get power consumption down to where color LCDs will be usable in battery-powered, notebook-sized machines. Remember, too, that LCDs are slow. The biggest obstacle to using a mouse with an LCD screen is that the cursor disappears during fast movements because the LCD can't refresh itself fast enough to keep up with it. Pens have the same problem. Thin-film transistor displays solve it, but at considerable cost in size, price, and power consumption.

Despite the limitations, I look forward to pen-based systems for many applications. I can think of a dozen occupations that would benefit enormously from having the power of today's notebook computers in a clipboard-sized package that you can hold in one hand and operate with the other. I suppose some keyboard-phobic executives will adopt them, too, but that's hardly a growth market.

I, for one, would love to have a desktop tablet with a color LCD and a pen. It would be great for preparing presentations, editing text (a system that could interpret editing with proofreader's marks in real time would be an incalculable advantage to those of us in the text preparation business), and not having your work in progress visible to the whole world. I'd require a keyboard, too, of course.

Pen-LCD-keyboard hybrids stand a good chance of becoming the personal computer of the future. All this started with papers flat on a desk. We gradually moved the desktop metaphor upright, onto a CRT. Now it looks like progress will put it all back on the desktop again. ■

Everything You Ever Wanted In UNIX. And Less. \$99.95*

OK. We know it's hard to believe. So just consider this. Coherent™ is a virtual clone of UNIX. But it was developed independently by Mark Williams Company. Which means we don't pay hundreds of dollars per copy in licensing fees.

What's more, Coherent embodies the original tenet of UNIX: small is beautiful. This simple fact leads to a whole host of both cost and performance advantages for Coherent. So read on, because there's a lot more to Coherent than its price.

SMALLER, FASTER...BETTER.

Everybody appreciates a good deal. But what is it that makes small so great?

For one thing, Coherent gives you UNIX capabilities on a machine you can actually afford. Requiring only 10 megabytes of disk space, Coherent can reside with DOS. So you can keep all your DOS applications and move up to Coherent. You can also have it running faster, learn it faster and get faster overall performance. All because Coherent is small. Sounds beautiful, doesn't it?

But small wouldn't be so great if it didn't do the job it was meant to do.

LESS IS MORE!	Coherent For the IBM-PC/AT and compatible 286 or 386 based machines.	Santa Cruz Operation's XENIX 286, Version 2.3.2
No. of Manuals	1	8
No. of Disks	4	21
Kernel Size	64K	198K
Install Time	20-30 min.	3-4 hours
Suggested Disk Space	10 meg	30 meg
Min. Memory Required	640K	1-2 meg
Performance*	38.7 sec	100.3 sec
Price	\$99.95	\$1495.00

*Byte Exec benchmark, 1000 iterations on 20 MHz 386. Hardware requirements: 1.2 meg 5¼" or 1.4 meg 3½" floppy, and hard disk. Does not run on Microchannel machines.

EVERYTHING UNIX WAS MEANT TO DO.

Like the original UNIX, Coherent is a powerful multi-user, multi-tasking development system. With a complete UNIX-compatible kernel which makes a vast world of UNIX software available including over a gigabyte of public domain software.

Coherent also comes with Lex and Yacc, a complete C compiler and a full set of nearly 200 UNIX commands including text processing, program development, administrative and maintenance commands plus UUCP.

CRITICS AGREE: IT'S AN INCREDIBLE VALUE!

"Mark Williams Co. seems to have mastered the art of illusion; Coherent comes so fully qualified as a UNIX clone, you find yourself thinking 'I can't believe it's not UNIX.'"

—Sean Fulton, UNIX Today!,
November 26, 1990

"...(Coherent) may be the best thing that has happened to UNIX yet."

—William Zachmann, PC Week,
November 5, 1990

"If you want to come as close as you can to real UNIX for a low price, COHERENT can't be beat."

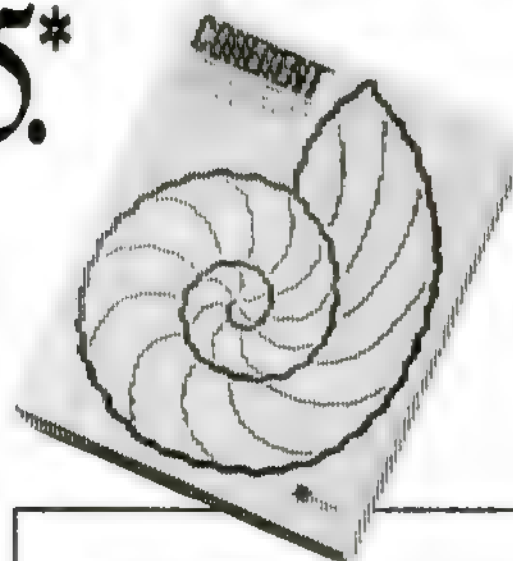
—Warren Keuffel, Computer Language
Magazine, November 1990

"If you want a UNIX-like development and learning system for less than \$100...I don't see how you can go wrong with Coherent."

—David Fiedler, BYTE Magazine,
November 1990

EXPERIENCE, SUPPORT AND A 60-DAY MONEY BACK GUARANTEE.

Wondering how something as good as Coherent could come from



NEW COHERENT RELEASE 3.1 NOW WITH...

- elvis: vi editor clone
- SCSI (Adaptec AHA 154x series and more on the way.) and ESDI support
- UUCP Bulletin Board System
- RAM disk support
- And much, much more!

OVER 10,000 SATISFIED USERS!

nowhere? Well it didn't. It came from Mark Williams Company, people who've developed C compilers for DEC, Intel, Wang and thousands of professional programmers.

We make all this experience available to users through complete technical support via telephone. And from the original system developers, too!

Yes, we know \$99.95 may still be hard to believe. But we've made it fool-proof to find out for yourself. With a 60-day money-back no-hassles guarantee.

You have to be more than just a little curious about Coherent by now. So why not just do it? Pick up that phone and order today.

You'll be on your way to having everything you ever wanted in UNIX. And for a lot less than you ever expected.

1-800-MARK WMS
(1-800-627-5967 or 1-708-291-6700)
FAX: 1-708-291-6750
60-DAY MONEY BACK GUARANTEE!



**Mark Williams
Company**
60 Revere Drive
Northbrook, IL 60062

*Plus shipping and handling. Coherent is a trademark of Mark Williams Company. UNIX is a trademark of AT&T. XENIX is a trademark of Microsoft.

ZEOS[®] '486

Complete 25 MHz system Only \$3695,

THE CHOICE IS YOURS!

**Take your pick:
Order your own
ZEOS 25MHz or
33MHz '486 EISA
system at new low
prices.**

**Choose from our
broad selection
of money saving
packages or let us
custom configure a
system just for you.**

**Whatever you decide,
you'll see why ZEOS
is the technology
leader in high speed
'486 EISA systems.**

**Call now to order!
800-423-5891**



EISA!

33MHz system Only \$4695.

THE POWER AND THE PROMISE DELIVERED!

Available right now! ZEOS harnesses the incredible power of the '486. Then we combine it with all the advantages of the EISA bus. The result is the finest computing platform you can buy. And it's ready for you *today!*

THE POWER OF THE '486

The '486 chip is a technological marvel.

It includes not only an advanced processor core but also a built-in cache controller, memory cache, floating point math coprocessor, and an advanced memory management unit. Running 40%-50% faster than similar '386 chips, the '486 makes short work of any processor-intensive applications. But where does it *really* shine?

THE PROMISE OF EISA

It really shines when ZEOS combines it with the EISA 32-bit bus! The '486 is a 32-bit processor. It runs 32-bit software. And, to bring out its full potential, it *demands* a 32-bit bus. That bus is EISA. It is the perfect bus for the '486 and it is the only bus you should consider if you are purchasing a '486 system. Why?

Compatibility for starters. Just as the '486 processor offers full compatibility with all of your software, the EISA bus accepts your present 8-bit and 16-bit expansion cards and runs them without a hitch. And then the performance *really* kicks in.

We're talking about 32-bit hardware performance. It's the reason the '486 was invented. To unleash the potential of 32-bit software *and hardware*. And ZEOS gives you both.

ZEOS '486 EISA. INCREDIBLE VALUE!

Price, Performance, Quality and Support. *Value*. These are the ZEOS hallmarks. Remember, it was ZEOS that invented 24 Hour a Day Toll Free Technical Support. Others have since copied us, but *no one* can match ZEOS support. It's the best in the business.



And that's only the start of your ZEOS Customer Satisfaction package. Add to it our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Parts Replacement Policy. You're going to be very satisfied. We don't just say it. *We Guarantee It!*

ORDER YOUR OWN ZEOS '486 EISA TODAY!

Ordering your own ZEOS '486 is easy. Simply pick up the phone and give us a call at 800-423-5891. For a personal workstation, file server or *any* high performance application, your ZEOS '486 EISA is the perfect solution. That's not just a promise. That's a *Guarantee*.

ORDER NOW TOLL FREE 800-423-5891

DON'T FORGET THE OPTIONS!

ZEOS has them all. Starting with blazing 32-bit EISA cards and every other high performance option you could want. Choose from a huge selection of hard drives, video packages, and more. Whatever you need to equip your system to your exact needs. On-site service is available too. Call 800-423-5891 for details.

**THE COMPLETE
25MHz ZEOS '486
EISA DESKTOP!
WITH 85MB DRIVE,
2MB MEMORY
& MORE.**

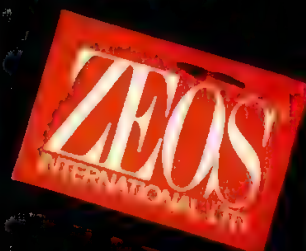
**ONLY \$3695
33MHz Only \$4695**

- Genuine Intel® 80486 25MHz or 33MHz CPU with built-in Cache and Math Coprocessor. 8/25MHz (or 33MHz) Dual Speed.
- Eight 32-bit EISA expansion slots. Also accepts 8-bit & 16-bit cards.
- 2MB of High Speed DRAM, expandable to a Total of 32MB.
- Ultra Fast 85MB IDE Hard Drive, Teac® 1.2MB Floppy Drive.
- Genuine Hercules® brand graphics controller. 14" High-Res Amber Display with Tilt/Swivel base.
- ZEOS/R5 101 key Space Saver Keyboard.
- ZEOS I/O Card with Two High Speed Serial plus Parallel & Game port.
- Rugged ZEOS 5-bay desktop case.
- 300 Watt Power Supply for additional expansion, an important extra at no additional cost.
- Plus Your ZEOS Absolute Satisfaction 30 Day Money Back Guarantee, Full One Year Limited Warranty and Express Parts Replacement.
- 24 Hour a Day Toll Free Technical and Sales Support on your ZEOS Hotline.

128K Cache Systems also available.

**ORDER NOW TOLL FREE
800-423-5891**

FAX Orders: 612-633-1325
Minnesota: 612-633-4591
Hearing Impaired:
800-228-5389
Outside US and Canada:
612-633-6131
MasterCard, VISA,
Discover, Am Exp,
Z-CARD and COO
Open 24 Hours a Day,
365 Days a year!



Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations: 486 of Intel Corporation; ZEOS and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company. NASDAQ symbol: ZEOS

CIRCLE 772 ON READER SERVICE CARD

PC-MOS

The Multiuser DOS Platform For The '90s

The 386 and now the 486 microprocessors have focused a lot of attention on the multiuser, multitasking possibilities of advanced PCs. A myriad of software and hardware manufacturers are promising a new age of multiuser options in the '90s.

But when you take a closer look, only one solution focuses on the features you want and anticipates the capabilities you need to use your PCs to their greatest potential. That solution is PC-MOS™ from The Software Link, the first DOS-compatible, multiuser, multitasking operating system.

A Network Alternative

The advantage to the PC-MOS shared processing solution is its ability to maximize the available memory on your PC, taking full advantage of extended memory and sharing it with up to 25 users on inexpensive terminals or monitors. You can share data with the same speed and integrity of a network solution without the expense of network cards and the waste of under-utilized PCs. And no additional investment is required to get the multitasking capabilities inherent in PC-MOS.

A Network Enhancer

For affordable network expansion, PC-MOS servers can be connected to other servers with The Software Link's LANLink or with the PC-MOS

GATEWAY™ to Novell's NetWare®. This connectivity lets a business configure its automation systems for departmental efficiency and expand affordably as needs grow with LANs or even WANs.

DOS Compatible

The PC-MOS alternative is clear: DOS compatibility means your users can continue to use all the popular software packages. And that means no investment loss, no retraining and no limitations in available applications.

An Unbeatable Solution

The next decade of shared processing will be clouded with choices. Only one operating system was first to offer you DOS-compatible, multiuser, multitasking solutions. Only one operating system continues to provide unbeatable multiuser solutions for over 150,000 users. PC-MOS from The Software Link. Call today and set your computing sights on a more productive horizon.



THE SOFTWARE LINK

1-800-451-LINK

3577 Parkway Lane, Norcross, GA 30092
(404) 448-5465 FAX: (404) 263-6474 TELEX: 4996147 SWLINK

VARS and RESELLERS:

Ask about our Sales Support Program

GSA Schedule/GSOOK 90 AGS6448
CIRCLE 393 ON READER SERVICE CARD

PC-MOS is a trademark of The Software Link. All other products referenced are trademarks of their respective companies. Prices, policies and specifications subject to change without notice.



John C. Dvorak



Data Has No Worth

CD-ROM will never achieve its promised impact unless manufacturers do something drastic. . .

In an information age, as the amount of available information increases, its value becomes less and less. As the amount of information approaches infinity, its worth approaches zero. This means selling information in the world of the future is futile.

The key to understanding the failure of CD-ROMs is knowing the difference between code and data. Code is a series of messages designed to instruct the computer to do a robotic function. A computer is turned into a printing machine, a device to manipulate words and texts, or a calculator. All these are robotic functions. I no longer retype my manuscripts, my robot computer does it, thanks to these programs I bought. Because the robotic functions save me time, I pay accordingly. If I can customize my "robot" to my liking, then I may pay even more. It's worth it.

By comparison, data is almost worthless—like a heap of dirt laced with gold dust. How much of the dirt has any real value to the miner? Not much. The bigger the pile of dirt, the more work that has to be done to extract necessary information. This notion underlies the failure of CD-ROM to fulfill its promised impact.

The formula to make money in CD-ROMs has nothing to do with current paradigms. You can't take 100 books on a subject, calculate their individual value as, say, \$2,000 and then sell a CD-ROM version of the books all combined for the "bargain" price of \$395. The flaw in the logic is the assumption that the buyer of the CD-ROM really wants all 100 books, or even 10 of them. The buyer probably only wants a couple of books. The other 98 books are superfluous. They are nothing more than useless data.

If the same CD-ROM costs less than the two books that the person wanted—say, \$19—there would be a flood of interest. For \$19, people will pay not only for the needed data but for the perceived prestige of "owning" so many "books." This price certainly is do-able since it only costs a buck or two to manufacture a CD-ROM.

Universal ratios exist that create untold

demand for high technology products. In the case of hardware, the ratio appears to be between 10 and 20 to 1. If what you buy today cost 10 times as much a few years ago, then its sales will increase beyond expectation. This was true at the beginning of the microcomputer revolution, and it's true today. People talked about how for \$5,000 you could have computing power that cost \$50,000 to \$100,000 "just a few years ago." As this perceived ratio increased from 10 times to 20 times or more, sales ballooned. There is no reason to suspect that the same isn't true with data.

If we look at something like *Microsoft Bookshelf* (which contains *Bartlett's Quotes*, the *American Heritage Dictionary*, a thesaurus, almanac, and a few other references), with a printed book value of about \$250 at a 10 to 1 reduction ratio, the *Bookshelf* CD-ROM should retail for \$25, not its suggest price of \$295! I would argue that a 20 to 1 ratio might be more appropriate for CD-ROMs, since they are essentially just raw data. While they do include a lookup engine with some minor robotic function, the search engine could easily be sold separately as true "code."



ILLUSTRATION NED SHAW

At a 20 to 1 ratio, *Microsoft Bookshelf* should sell for \$12.50. At \$295, it's no coincidence that *Microsoft Bookshelf* is one of the least-successful products in the history of Microsoft and almost a laughingstock within the company. This despite the fact that it is a fantastic product. Apparently fantastic is not enough. There are market forces at work here, and nobody selling CD-ROMs seem to have a clue about them.

My advice to the boys: Cut prices.

THE GOLD STANDARD. NOW IN BLACK.



Unique
dual-locking
mechanism
assures a
tight, shock-
resistant seal.

Now that data processing has outgrown the controlled environment of the "Computer Room," it's become a tough world for the floppy disk.

Today diskettes are at work almost everywhere. Even in such inhospitable environments as bumpy airplanes, crowded commuter trains, and dusty factories.

All putting your invaluable data at risk.

Now Maxell introduces the MF2-HD Super RD.

With advanced technology whose time has come because

it assures an outstanding performance even in extreme operating conditions.

The key is our revolutionary new Dual Interlocking Flex Shutter. Ten Maxell patents are pending on this unique mechanism, designed to protect the internal environment and lock tightly even when accidentally jarred or dropped.

But MF2-HD Super RD superiority doesn't stop there.

New high-energy magnetic particles improve the signal-to-noise ratio by 10%, thus enhancing drive compatibility. The "superuniform" particle dispersion achieved in our Neo-Cross Linkage

Magnetic Layer delivers extremely stable output. And an improved HD lubricant and HT binder helps keep both disk and drive head free from foreign particles.

And the distinctive black shell, precision-molded of a super-flexible composite material, offers excellent drive compatibility and improved head-to-disk contact.

The Gold Standard. Now in black, and ready for your most demanding applications.



maxell.
THE GOLD STANDARD

Maxell Corporation of America, 22-08 Route 208, Fair Lawn, NJ 07410

John C. Dvorak

Inside Track

The **biggest fiasco** in the industry was the obituary written in *The Wall Street Journal* recently when OS/2 was **pronounced**

dead. Microsoft was supposedly going to drop the product and concentrate on *Windows*. The pundits who have, in vain, been promoting OS/2 as the second coming nearly had a **collective heart attack**. After all the facts were straightened out it seemed that nothing changed except that there was even more talk of a portable OS/2.

The **portable OS/2** is designed to run on RISC chips, and it's sometimes called RISC OS/2 within Microsoft. What I've been waiting for is a portable DOS. (Or a RISC DOS or some such thing.) When the world made a transition from CP/M to MS-DOS, there was a small company called Seattle Computer Products that modeled an operating system after CP/M and coded it for the 8086 family of chips. It was eventually bought by Microsoft, who sold the OS as PC-DOS, then MS-DOS and bingo—**untold wealth** was generated. This cycle of events can happen again, once people realize that the **key to success** with desktop computers is simplicity. CP/M and MS-DOS are simple, easy-to-use operating systems. Put an equivalent on a SPARC-based el cheapo machine and see what happens.

Let me **throw in my two cents** about OS/2. Without exception, developers say that writing code for the OS/2 operating system is a dream come true. "Easy!" seems to be the word most often heard. It seems to me that one constant in the world of computing is that success is a function of the relationship between easy to use for the end user and hard to use for the developer. **Not the other way around**. The popular Mac OS is a perfect example and so is *Windows*. OS/2 is cumbersome for the end user. It's not DOS. It's not a cinch, **and it's expensive**. End users couldn't care less about how easy it is for an applications coder to write a program. Perhaps they should care, but they don't. They see it as a **personal hassle** and that's that. The hassle should be borne by the developers whose job it is to make life easy for the end user. That's why developers make the big bucks.

Maybe this will change when the dominant chip changes to something new. Of course, nobody knows what will be the next **dominant chip**. With AMD coming on-line with its 386 clone and Nextgen about to announce a 386 clone with RISC aspects, all hell is going to break loose. Word has it that **Chips and Technologies** will release a 386 clone too. The company to watch, though, may be **performance-minded Weitek**,

makers of coprocessors. Here's a company with some hotshots **itching to do a processor chip**, I'm told.

Great Product Dept.: While I see a lot of interesting products, this simple concept is one of the great products of the year. It's called ETC—the Easy Transfer Cartridge. It's a laser printer cartridge that contains a **special sublimation dye** toner. Whatever you print on a sheet of paper can be transferred to a T-shirt, a plaque, or even a coffee mug. I now have a coffee mug with the **Dvorak logo** made with this stuff.

There are other manufacturers of cartridges that contain various dyes that can be used to do this, but no one else has the deep colored sublimation dyes. **That's the key**. This is the first cartridge that I've seen that I can recommend. It's an outstanding product. The cartridges come in **five colors** and cost about \$195 each. Call 415-621-5586 for more information or write to Easy Transfer Cartridges, 1335 Sixth St., San Francisco, CA 94107. Hot stuff!

More T-Shirt-Related Goodies Dept.: While everyone is gah-gah over the **Roland MT-32**, the definitive sound add-on for PCs, few realize that Roland (1961 McGaw Ave., Irvine, CA 92714; 714-975-0560) has gone off in a **slew of other directions** with odd devices.

One such peripheral device is the Stika vinyl cutter. This thing, using a computer or using internal capability, is a kind of a **"psycho-plotter"** (plotter-with-a-knife, get it?) that's designed to cut letters, shapes,

or designs out of special vinyl material or iron-on transfer material. The cut-outs are then glued on large posters or whatever. The iron-on stuff is usually put on a T-shirt. Roland's basic Stika unit is definitely **worth a looksee** at \$895. Very interesting.

Chaos, Chaos Everywhere Dept.: James Gleick made a fortune developing a new theory about the way things are with his **fascinating** book *Chaos—Making a New Science* (Penguin Books). Next thing you know, Autodesk, which seems to be somewhat unfocused with some of its recent products, brings out a software package called *James Gleick's Chaos*. The package may end some arguments in the math community because it looks as though the Chaos theory is really a **subset of the computer graphics world**, not math at all. I really can't imagine a better way to **design fake clouds**. If you're into computer graphics you should check it out. It sells for \$59.95. Call Autodesk at 800-688-2344 or 415-331-0356 for more information. ■

Word has it that
Chips and
Technologies
will release a 386
clone, and the
coprocessor
jocks at Weitek
are dying to make
a processor
chip, too.

*T*rade in any old PC.



Now you can turn your outdated PCs into some great new PCs. And save \$500 on every one. With Digital's PC Trade-In Deal. Here's how it works.

Simply trade in any industry-standard PC. No matter who made it. And we'll give you \$500 off on a brand-new industry-standard PC from Digital. What a deal! And what a Digital PC you'll get!

The Digital PC family covers everything from our highly affordable 386sx-based machine, to a full range of 386's, to our high-performance 486. And you can take your pick of a complete range of top-quality, Digital-supported expansion options and peripherals.

So get in on the Digital Trade-In Deal. Just call 1-800-343-4040, Ext. 877. Or call your local Digital Authorized Distributor. Today.

And take \$500 off on a new Digital PC.



Digital PC Trade-In Selection Guide

	212LP	316sx	320sx	320+	325c	333c	425c
Processor	80286	80386sx	80386sx	80386	80386	80386	80486
Speed	12 MHz	16 MHz	20 MHz	20 MHz	25 MHz	33 MHz	25 MHz
Maximum Memory	16 MB	16 MB	16 MB	16 MB	16 MB	16 MB	16 MB
AT/XT Slots	3	3	3	6	6	6	6

digital™



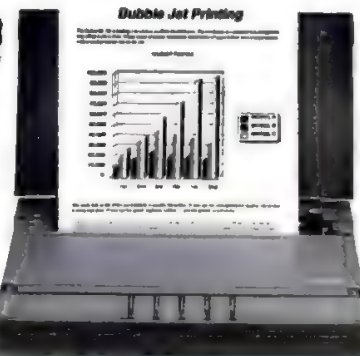
We've made it easier
for you to get a handle on your work.

Whether you're in your office using your desktop computer or on the road with your laptop, you only need one printer. The four-pound BJ-10e.

The BJ-10e emulates the IBM® Proprinter® X24E, allowing you the choice of hundreds of supported software applications. Plus, it prints quickly, quietly, and with the high resolution you expect from some of the best desktop printers.

Buy the Canon BJ-10e Bubble Jet™ printer before May 15, 1991, and you'll get a great carrying case—FREE! It'll help you get an even better grasp on your work.

Call 1 (800) 848-4123 for details.



Canon
BUBBLE JET PRINTER
BJ-10e

Working To Improve Your Image.™

Carrying case available at point of purchase through May 15, 1991. Offer valid in the U.S.A. only. Void where taxed, prohibited or restricted by law. • Canon® and BJ® are registered trademarks and Bubble-Jet is a trademark of Canon Inc. • ATM is a trademark of Adobe Systems Inc. • Publisher's POWERPAK is a trademark of Aesch Software. • The Ashton-Tate logo is a registered trademark of Ashton-Tate Corp. • FaceIt is a trademark of Bitstream, Inc. • Computer Associates® is a registered trademark of Computer Associates. • Digital Research® is a registered trademark of Digital Research, Inc. • FormTool® is a registered trademark of Bloc Publishing. • Lotus® is a registered trademark of Lotus Development Corp. • The Microsoft logo is a registered trademark of Microsoft Corp. • Quicken® is a registered trademark of Intuit. • SPC Software Publishing is a trademark of Software Publishing Corp. • The Symantec logo is a registered trademark of Symantec Corp. • The WordPerfect logo is a registered trademark of WordPerfect International Inc. • The Xyquest logo is a registered trademark of Xyquest, Inc. • SuperPrint® is a registered trademark of Zenographics, Inc.

CIRCLE 155 ON READER SERVICE CARD

© 1991 Canon U.S.A., Inc.

Jim Seymour



How Microsoft Blew It with Word 5.5

These days, is progress in the personal computer industry achieved by betraying thousands of loyal users?

What's the value of an interface? In dollars and cents, I mean? More to the point, what are the costs and risks for a vendor in discarding a well-established interface for a new one—and the costs and risks for the users who've come to rely on that program?

I wish Microsoft had thought about those questions a little more before it changed the interface on *Microsoft Word*.

The short and not-so-sweet of it: I think Microsoft trashed a genuinely great program. And to judge from the comments I've been getting via reader mail, my MCI Mail box, and users I talk with in client companies, I'm not alone. Microsoft's dilemma was a tough one, and it's illuminating. Let's dig into what Microsoft did, and how it turned out—at least, how I think it turned out.

Whatever you may think of *Word*, from about Version 3.0 on through the next-to-last Version 5.0, it has been a major contender

in the marketplace. Always second to *WordPerfect* in sales, it nonetheless commanded a very large and hugely profitable market share. If it galled Microsoft that *Word* never edged *WordPerfect*, it nonetheless made a great deal of money for the company.

BUILT UPON A SOLID PAST

Part of that success was due to the muscle of the Microsoft marketing machine, but a larger part of it was due to good program design. *Word* is enormously powerful, with a robust macro language, rich printer support, and the best stylesheet feature extant. *Word* has a clean, uncluttered look on-screen; it doesn't get in your way. It's also internally consistent; once you've learned how to do a dozen things in *Word*, you can make very good guesses about how to do a thousand other things.

Most important, Microsoft has done a superb job of keeping *Word*'s interface consistent over many upgrades. When we learn a program, then decide we like it so much that

we adopt it as our tool for a certain kind of work, we expect to be able to stay within that program's paradigm (read: interface) for a long time to come. In other words, the interface can't abruptly change, leaving us wondering how to use the next release.

New versions of software must function as extensions of previous releases, not replacements. *Word*, Version 5.0, met that test.

Microsoft took some heat from corporate customers, who claimed *WordPerfect* was easier to teach. (That hasn't been my experience, and I've taught hundreds of corporate people how to use PC applications, including both programs. Indeed, I think it works the other way around: *WordPerfect*'s tangle-fingered use of Ctrl or Alt or Shift with function keys to do most things is harder to teach, harder to learn, and harder to remember than *Word*'s idiosyncratic but consistent interface.)

Word's number-two standing in the market had long rankled Microsoft's top brass. Maybe a new interface would help it pick up sales.

A CHANGE IN THE WIND

Then along came *Windows*. Microsoft jumped out front early with a superb *Windows*-based word processor, *Word for Windows*. "*WinWord*" is an astonishingly rich program, and



ILLUSTRATION: NED SHAW

despite competition from Samna/Lotus's *Ami Pro*, *WinWord* has become the kind of big-hit, market-leading word processing program for the *Windows* universe that always eluded Microsoft in the DOS world of word processing.

But what to do about character-based *Word*? It was so strong in most areas that while it still

Jim Seymour

needed some tweaking—a magnified, editable Preview mode, for example—there wasn't much left to do with it. And despite *WinWord*'s market success, *Word* 5.0 continued to do well in the marketplace.

Microsoft had two big-selling word processing programs. *WinWord* staked out the high ground in GUI-based word processing; *Word* 5.0 was the hot, number-two entry in character-based PC word processing.

What a market straddle!

Sounds pretty good, huh? "Don't mess with perfection" time, eh?

But Microsoft *did* mess with *Word*, and in the process produced an "upgrade" that made *Word* users weep.

NO "ESCAPE" FOR WORD 5.5

Microsoft's notion was to provide a bridge product between character-based *Word* 5.0 and the GUI *WinWord*. So the designers crafted the new *Word* 5.5—a program that uses drop-down menus (complete with IBM Common User Access-style Alt-then-something keyboard shortcuts), a *WinWord*-like "ribbon" stripe near the top of the screen with formatting information, character-based simulations of *Windows* scroll bars—and a squinchy little "working" area on-screen, bounded by all this mess.

Microsoft forsook *Word* 5.0's clean, open screen for a feeble imitation of a graphical interface.

But worst of all—the unforgivable sin—Microsoft changed almost all the commands. *Word* users whose fingers had learned Esc-T-L (for Transfer, Load) to begin work on an existing file now have to learn Alt-F-O (for File, Open) to do the same thing. To save that file, users once typed Esc-T-S (for Transfer, Save); now they must type Alt-F-S (for File, Save).

It's like that throughout *Word* 5.5: Forget what you and your fingers know, and learn to do it *this* way instead.

(In fairness, Microsoft did make it possible, at installation, to choose between *Word* 5.0's keyboard shortcuts and the new ones introduced with Version 5.5. Not the basic commands, just the shortcuts. Thus you can still hit Ctrl plus F10 simultaneously for a fast file-save...but if you want to use the "real" file-save command in 5.5, you have to go through that

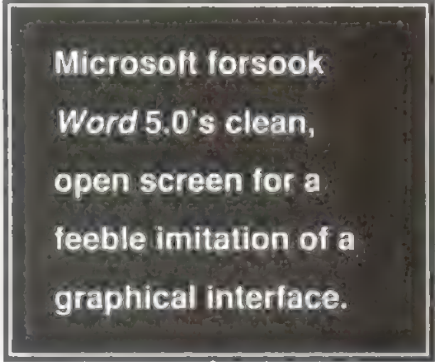
dreary CUA-style Alt-F-S drill.)

Microsoft created a program that is neither fish nor fowl, with neither the graphical richness of a GUI word processor nor the raw speed and power of a character-based one.

This is an upgrade?

DON'T MESS WITH THE INTERFACE

Some at Microsoft worried about *Word* 5.5. They understood Microsoft was preparing to launch a *downgrade* on the world, and as a last step, argued successfully for throwing a copy of good old *Word* 5.0 into the box with every copy of 5.5. That way,



Microsoft forsook
Word 5.0's clean,
open screen for a
feeble imitation of a
graphical interface.

users who bought the package but found out too late they were buying something completely different from what experience led them to expect could at least throw out the 5.5 disks and put Version 5.0 on their hard disks.

If they didn't have it already. What is a *Word* 5.0 user who upgrades to 5.5, then discovers he dislikes it, to do? He already has 5.0. . . .

I've held off writing this column for several months. When I saw *Word* 5.5 in beta, I was horrified, but determined to actually use it for awhile. Maybe it really was better, and I was just a victim of habit—a common syndrome among PC users.

But I have just come out of a long and dreary tunnel of using *Word* 5.5 for an extended period. I may not know it as well as I know *Word* 5.0 and earlier releases, but I know *Word* 5.5 very well. And to know it is *not* to like it.

Deciding how to handle compatibility in upgrades is always a problem for software publishers. But if there are two cardinal rules in the game, they are (1) don't change the look and feel of the program fundamentally, and (2) don't throw away users' familiarity with existing versions' command trees.

This is a big-money issue; serious lawsuits have been fought over these points. Lotus was protecting a significant investment in its interface—expressed in both the look and feel of *1-2-3*, and even more importantly in *1-2-3*'s commands—when it sued Paperback Software over the *1-2-3* clone, *VP/Planner*.

The *VP/Planner* people argued that a large installed base of users familiar with one program's command structure would *never* change to another that required them to relearn the commands. Lotus said, in effect, "Exactly—that's why you can't use our interface."

Lotus won, of course.

Where was Microsoft during all this? Didn't the company understand what it was doing to loyal *Word* users? Didn't Microsoft understand what it was doing to itself?

WHAT IS THE LAST WORD?

When we choose to go through an epochal change on the operating-system level—or with *Windows*, the operating-environment level, we indicate our willingness to learn a new set of commands, a new set of work habits. Short of that epochal change, however, we want improvements within a consistent interface.

The final intriguing question here is what Microsoft will do about further upgrades of character-based *Word*. A cynic might say they probably won't do any more upgrades at all, because Microsoft's game plan is to push us all into *Windows*.

But let's say Gates, *et al.*, are more benign than that. Do they upgrade only the "new *Word*"—Version 5.5—leaving those committed to the more-productive *Word* 5.0 interface even further behind? Or do they upgrade *both* character-based versions of *Word*?

Can anyone afford that kind of investment in programmers' time these days? And what would Microsoft call the resulting products?

My guess is that Microsoft, rather than winding up with strong entries in both worlds, has shot itself in the foot with *Word* 5.5. Although the character-based word processing environment, a real *production typing* environment, will be important for years to come, character-based *Word* won't be very important any more.

Hitching your star to *Windows* is one thing. Bill. Kissing-off a major product like *Word* by abandoning your users' needs is quite another. ■

If you think the LaserPrinter E looks good in person,



wait till you see how it looks on paper.

Any way you look at it, the IBM LaserPrinter E gives you a lot of appealing features at a very appealing price.

The affordable IBM LaserPrinter E gives you all the advantages of laser quality output 25% faster than the major competitor, the HP LaserJet IIP. The IBM LaserPrinter E also comes standard with four times the paper capacity and twice the number of font slots.

Plus, the IBM LaserPrinter E is unique in its price range because it lets you customize your printer's speed and features to meet your exact needs at any given moment. All of which makes the IBM Laser Printer E the only affordable

	The New IBM LaserPrinter E	HP LaserJet IIP
Speed	✓ up to 5 ppm	up to 4 ppm
Speed upgrade option	✓ up to 10 ppm	No
Adobe PostScript option	Yes	Yes
Printer emulation	✓ IBM, HP PCL	HP PCL
Std. plotter emulation	✓ Yes	No
Font card slots	✓ 2	1
Std. input paper tray capacity	✓ 200	50
Std. output paper tray capacity	✓ 100	50
Opt. sec. input paper tray capacity	✓ 500	250
Opt. envelope tray capacity	✓ 75	20

laser printer that lets you buy now and grow later.

For example, if you decide you want faster printing, only the LaserPrinter E lets you double its speed.

Or if your software requires the Adobe PostScript® language, the LaserPrinter E can also give you that creative flexibility at a reasonable price.

Or if you decide you could use automatic collating of letterhead, second sheets

more desk space.

So whether your first requirement is affordability, performance or flexibility, the IBM LaserPrinter E should be at the top of your shopping list. See it today by calling 1-800-IBM-2468, ext. 982, for the name of your nearest IBM Authorized Remarketer.

and envelopes, the LaserPrinter E lets you add that, too.

Yet no matter how many features you add, the LaserPrinter E's unique stackable design takes up practically no



tele mart

Where smart buyers find smart buys.

Quarterdeck



DESQview 386

A DOS-based multi-tasking operating environment which runs on 386, 386SX and i486 PCs

\$116

TERMINALS

Wyse	
30	\$289
50	369
60	289
85	355
150	275
160	339
185	355

LOWEST PRICES
Industry Price Leader.

TAPE BACKUP

Colorado Memory System	
Jumbo 120/250	\$295
Jumbo 40/80 INT.	245
Irwin	
40 MG Internal	349
80 MG Internal	439

BEST SELECTION
We have the product you want.

DISKETTES AND TAPES

Sony	
3.5 D/S D/D Case Disks	\$75
3.5 H/D (Case Only)	145
5.25 D/S D/D Disks (100)	50
5.25 High Density (100)	90
Sony Tape	
150 MB/5.25	20
20-40 MB/3.5	15
60 MB/5.25	19

COREL DRAW!



"The World's Finest PC Illustration Software (New Version)"

\$365

BOARDS

ATI	
VGA Wonder + 256K w/Mouse	189
VGA Wonder + 512K w/Mouse	225
Everex	
RAM 3000 Deluxe	79
RAM 8000	175
Hercules	
All Other Models	Call
Intel	
Above Board + 512K Plus	329
Above Board + w/2MG P/S	525
Above Board + w/2MG	
Expands to 8 MG	499
Inboard 386 PC (1MG)	489
All Other Models	Call
Orchid	
Tiny Turbo 286	205
Tiny Turbo Xtra	265
All Other Models	Call
Paradise	
VGA + 256K	105
VGA + 16	129
VGA 1024 512K	190
Video 7	
Fastwrite VGA	149
1024 i w/256K	175
All Other Models	Call

FAX BOARDS

Complete	
4800	\$145
9600	295
Communicator	409
PC Portable Fax	295
Everfax	
24/96 INT	255

DrawPerfect



Create charts, graphs, slides & more...

\$263

WordPerfect
CORPORATION

CO-PROCESSORS

Cyrix	
80387 SX-16	\$229
80387 DX-20	289
Others	Call
Intel	
80287-XL	189
80387-DX 16	329
80387 SX-16	295
80387-DX 20	375
80387-DX 25	475
80387-DX 33	579
8087-1	159
8087-2	119

KEYBOARDS

Keytronics	
KB5151	\$119
KB5153	155
KB101Plus	89

tele mart

EXTENDED HOURS

Mon.-Fri. 6:00 am-10:00 pm MST
Sat. 8:00 am-5:00 pm MST
Sun. 10:00 am-3:00 pm PST

PCM43091

Imai



TURBOCAD

Awarded Best Buy CAD 4 yrs straight

\$76

OCR/SCANNERS HARDWARE

Complete	
400 Hand Scan	\$145
Full Page	529
Half Page 400 DPI	175
DFI	
Scanner HS-3000+	149
Logitech	
Scanman + XT/AT	149
Logi Scanman 256	282
Scanman + PS2	212

SOFTWARE

CAT Reader Pro 1/2 Page	\$159
CAT Reader Pro Full Page	229
Complete OCR/FP	289
Complete OCR/HP + 400	175
DFI OCR Deluxe	125

MOST RELIABLE
10 Years of Mail Order Excellence.

MICE

Kensington Expert Mouse Bus	\$110
Kensington Expert Mouse PS/2/SER	95
Logitech Serial Mouse	
New Hi-Res XT/AT	67
Logitech Bus Mouse	
New Shape Hi Res	74
Logitech Mouseman Serial Right Handed	65
Logitech Serial XT/AT Finesse Bundle	109
Logitech Trackman Bus	81
Logitech Trackman Serial	75
MS Bus or Serial Mouse 1.0	97
MS Bus or Serial w/Windows 3.0	145
Microspeed PC Trac Bus	82
Microspeed PC Trac Ser or PS/2	70
Omni Mouse II Bus	55
Omni Mouse II Serial	38
PC Trac Ball Serial	46
PC Trac Ball Bus	64

Microsoft



Microsoft Excel for Windows

\$299

PRINTERS

LASER

Canon	
LBP-4 Laser	915
Epson	
7000 Laser	859
7500 Laser	2087
Hewlett Packard	
Laser Jet IIP	1029
Laser Jet III	1699
Okidata	
OL-400	635
OL-800	959
OL-820	1275
OL-840	1909
Panasonic	
4420 Laser	869
Texas Instruments	
Micro Laser Postscript 17 Font	1209
Micro Laser Postscript 35 Font	1519
Toshiba	
Page Laser 6	635
All Other Models	Call

DOT MATRIX

Citizen Printer	
120D	139
180D	150
200GX	159
GSX 140/80	299
HSP 500	315
All Other Models	Call
Epson	
FX 850	319
FX 1050	450
LQ510	288
LQ850	482
LQ1050	655
LQ2550	957
LX810	189
All Other Models	Call
IBM	
Pro Printer II XL	345
Pro Printer II	265
NEC	
P3200	275
P3300	385
Okidata	
182 Turbo	290
320 ML Par	315
321 ML Par	445
390 Plus	449
391 Plus	605
393 Plus Color	1019
All Other Models	Call
Panasonic	
1123	239
1124	259
1124i	289
1180	155
1191	245
1624	385
1695	419
All Other Models	Call
Star Micronics	
NX 1020	189
NX 1500	295
NX 2420	289
All Other Models	Call

OTHER

Canon BJ-10E	315
Diconix 150 Plus	335
Seiko Smart Label Printer	165

ACCESSORIES

Logical Connection 512K	\$422
Logical Connection Plus	559
Masterpiece	82
Masterpiece Plus	95
Masterpiece Remote	102

A Decade of Experience Delivers



SHIPPING MOST ORDERS SHIPPED IN 24 HOURS



PRICE
A DECADE
OF THE
LOWEST PRICES



CONFIDENCE
WE DO NOT CHARGE
YOUR CREDIT CARD UNTIL
YOUR ORDER IS SHIPPED



CONVENIENCE
EXTENDED HOURS
LATE NIGHTS, SATURDAYS
AND SUNDAYS

Telemart Carries Much More Than Our Ad Can Hold!
If You Don't See What You're Looking For, Call Us!

COMPUTERS

DESKTOP

ALR	
Business Veisa 386/33 #101	\$1619
Power Flex 286/40MG	1029
AST	
All Models	Call

LAPTOP

Epson	
Equity Portable LT-286e	2220
Equity Portable LT-386sx	3129
Goldstar GS520 386SX 16mhz 40MB	1989
Leading Edge LT386SX +	1859
Sharp PC-5541	3069
Toshiba	
T-1000 SE	995
T-1000 XE	1255
T-1200 XE	2109
All Other Models	Call

NOTEBOOK

ALR Venture16 386SX 16 mhz 20MB	2469
Altima NSX386SX 20MB	2829
Epson NB3-S 20mb	2799
Epson NB3-S 40mb	3069
Everex Tempo XL 20mb	2519
Packard Bell	
PB286 NB 12 mhz 20 MB	1989
Panasonic CF-150 B	739
Panasonic CF-170	1495
Panasonic CF-270	1989
Poqet Hand Held	935
Texas Instruments 2000 20MB	2379
Texas Instruments 3000 20MB	3299
Texas Instruments 3000 40MB	3599

DISK DRIVES

Iomega (Bernoulli)	
40 Meg (Dual 20 MG)	\$1739
Beta 88 MG Dual 44	1809
Beta 44 MG Insider	899
All Other Models	Call
Seagate	
ST1102A 89 MG	369
ST1144A 124 MG	475
ST1239A 211 MG	759
ST151 42.5 MG	319
ST157A 44.7 MG	225
ST225 w/CNTR 20 MG	225
All Other Models	Call
Teac	
5 25 1.2 MG AT	65
5 25 360K XT	65
Toshiba	
3.5 1.4 MG	65

HARD CARDS

Plus Development	
IIXL 50 MG	\$375
IIXL 105 MG	645
II 40 MG	349
All Other Models	Call

MODEMS

Anchor	
1200 B	\$65
1200 EXT	95
2400 B	85
2400 EXT	119
ATI	
2400 ETC INT w/SW	169
2400 ETC EXT	189
Everex	
Evercom 12 INT	49
Evercom 24 INT	67
All Other Models	Call
Hayes	
1200 B	139
2400 B	225
2400 EXT	319
9600V Series EXT	609
All Other Models	Call
Intel	
2400 B Classic	139
2400 EXT	165
2400 PS/2	225
Practical Peripheral	
2400 B	125
2400 INT (w/MNP)	165
All Other Models	Call
Prometheus	
1200 B w/Software	49
1200 EXT Pro Modem	205
1200 G EXT	89
2400 B w/Software	99
2400 EXT Pro Modem	295
2400 G EXT	145
Pro Modem 9600 + EXT	695
All Other Models	Call
U.S. Robotics	
Courier 2400 EXT	265
Courier 2400 E(MNP)	315
Courier HST/PC INT 14.4	565
Courier HST 14.4 EXT	575
Zoom All Models	Call

FONT CARTRIDGES

Pacific Data 25 IN 1 III	\$259
Pacific Data 1-2-4 Plus 1 MB	164
Pacific Data Four 2 MB	139

MONITORS

Amdel	
All Models	Call
Amazing	
12" MM 1288	79
14" MM 1488	139
14" CM 8428	319
14" CM 8428 EX	365
Mitsubishi	
XC 1410 C EGA	329
XC 1429 C VGA	385
All Other Models	Call
NEC	
Multisync 2A	459
Multisync 3DS 14"	649
Multisync 4D	999
Multisync 5D	2349
Multisync GS-2A	205
Princeton	
Princeton Ultra 1400	509
All Models	Call
Sony	
Multiscan 1304 HG 14"	689
Zenith	
ZCM 1492	609

CD ROM

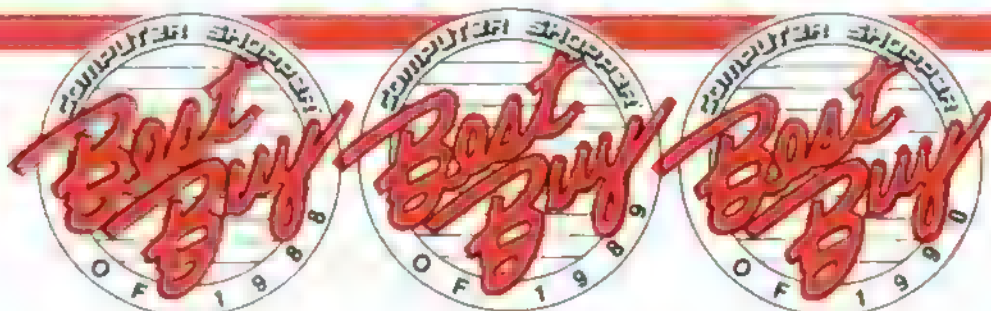
NEC CDR-72 XT/AT w/Interface	\$699
NEC CDR-83 XT/AT w/Interface	635
Panasonic	
Worm 940 MB	2199
Storage Dimensions	
All Models	Call
Toshiba	
CD ROM RDR w/SCSI EXT	705

MIT PRODUCTS

286-12 40MB 1MG	\$914
386SX-16 40MB 1MG	1227
386-25 80MG 4MB N/C	1966
386-25 80MG 4MB 64K cache	2134
512K VGA Card	130
Modem 2400B	102
Multi I/O	25
Tactile Keyboard	52

SOUND BOARDS

Creative Labs	
Sound Blaster	\$149
Sound Blaster Midi	80
Lantastic	
Voice Adapter	75
Ad Lib	
Music Synthesizer Card	109



1-800-622-6659

NOW ACCEPTING INTERNATIONAL ORDERS - Call our FAX at (602) 944-1510

VARs/Dealers - Call 1-800-537-6753

CORPORATE ACCOUNTS - Call 1-800-752-0561

CIRCLE 206 ON READER SERVICE CARD

PCM43091

BUYERS CHOICE



When you see the ☎ symbol, you're assured these products have been purchased most often by **telemart**'s national customer base.

All these products have been top ranked because you, the buyer, have selected them based on their performance and the **telemart** price.

You'll see the ☎ symbol in each category and know you can make the same smart choice.

GRAPHICS

Deluxe Paint II Enhanced	\$77
Graph In The Box Executive	159
Hot Shot Graphics	150
PC Paintbrush IV	54
PC Paintbrush IV Plus ☎	105
Printmaster Plus	32

PROGRAMMING & LANGUAGES

MS Basic	
Pro Development System	\$299
MS C Compiler	307
MS Cobol Compiler	569
MS Fortran Compiler	275
MS Macro Assembler	92
MS Pascal Compiler	185
MS Quick Pascal	61
MS Quick Basic	61
MS Quick C	61
Turbo C ++	68
Turbo C ++ Pro ☎	193
Turbo Pascal Pro 6.0	189

COMMUNICATIONS

Carbon Copy Plus	\$110
Carbon Copy Plus Host	185
CompuServe Membership Kit	19
Crosstalk XVI	103
Crosstalk Mark4	127
Mirror III 2.0	79
Procom Plus v2.0 ☎	63
Prodigy Start-Up Kit 3.1	25
Remote 2 Complete Pkg.	105

TIME MANAGEMENT

Calendar Creator Plus ☎	\$39
Quick Schedule Plus	54
Top Priority	53
Working Hours	53

INTEGRATED SOFTWARE

Lotus Symphony 2.2	\$479
MS Works ☎	92
PFS First Choice	76
SmartWare II w/Spell Chkr	429

Do A Little Windows Shopping With

telemart

Adobe Illustrator Windows	\$279
Adobe Streamline Windows	222
Adobe Type Manager Windows	56
Ami Professional	289
Asymetrix Toolbook	285
Becker Tools	45
Chansma	320
Corel Draw 2.0	365
Crosstalk for Windows	117
Current by IBM	213
Designer	455
Drafix Ultra Windows	407
Dragnet 1.0	79
Facelift for Windows	59
Facelift for Windows ValuePak	119
Form Base w/Windows	295
Form Publisher	135
Geoworks Ensemble	119
Grammatik for Windows	48
hDC FirstApps for Windows	48
hDC ICON Designer	29

hDC Windows Express	\$51
Informix Wingz	304
Language Master	44
MS Entertainment Pack	26
MS Excel for Windows	299
MS PowerPoint for Windows	305
MS Productivity Pack	38
MS Project for Windows	425
MS Word for Windows	305
Object Vision	88
Omni Page 386	432
PageMaker 3.01	489
PerFORM Pro	263
Prompt 1.0	74
Read Write Personal	152
Superbase 4	409
Ventura Publisher Gold/Windows	530
WINFAX	41
Wordscan 286/386	383
Wordscan + 286/386	649

WE ACCEPT INTERNATIONAL ORDERS AND CORPORATE PURCHASE ORDERS

PRESENTATION GRAPHICS

Animator	\$239
Drafix Ultra v4.0	232
Harvard Graphics ☎	295
Lotus Freelance Plus	311

SPREADSHEET

Lotus 1-2-3 Ver. 2.2	\$335
Lotus 1-2-3 Ver. 3.1	409
Lucid 3-D v2.2	54
MS Multiplan	119
Plan Perfect 5.1	Call
Quattro	65
Quattro Pro ☎	310
Supercalc 5	290

PROJECT MANAGEMENT

Harvard Project Mgr III	\$405
Lotus Agenda 2.0	275
Org + Advanced	59
Timeline 4.0 ☎	439

LAN & NETWORKING

SOFTWARE

Above LAN	\$234	ELS II	1149
ACCPAC BPI Network	229	Paradox 3.5 LAN	625
Data Ease LAN 3-Pak	439	PC Anywhere IV LAN	269
DBase IV Lan	636	Q & A Network Pack	252
Foxbase Plus LAN	269	R-Base LAN 3.1	582
Harvard Graphics LAN Server	564	Supercalc 5 LAN Pack	295
MS Excel Exec License Pack	245	WordPerfect Additional User 5.1	155
MS Word License Pack	182	XTree Net Advanced	289
Novell Adv NW/286	1953	XTree Net ELS	149
ELS I	508		

HARDWARE

Anthem		Lantastic Ethernet Starter	505
NE1000	\$155	Standard Microsystems	
NE2000	185	All Other Models	Call
Artisoft		Storage Dimensions All Other Models	Call
Lantastic 2MBPS Starter	345	Tiara All Other Models	Call

UTILITIES

BACK UP

Back It 4	\$70
Central Point Backup	57
Fastback Plus ☎	109
Norton Backup	93
PC Fullback Plus	47

GENERAL

Check It! 3.0	\$79
Copy II Option Board Deluxe ☎	106
Copy II PC 6.0	25
Mace Vaccine v3.0	59
Norton Editor	47
SPF/PC	143

HARD DISK MANAGEMENT

Disk Optimizer	28
Disk Technician Advanced	91
Fastrax	47
Lotus Magellan	96
Mace Utilities 1990	89
Norton Utilities 5.0	112
Optune	43
PC Tools Deluxe 6.0 ☎	86
QDOS II	34
SpinRite II	65
XTree Gold 2.0	89

LAPTOP

Battery Watch Release II	\$29
Brooklyn Bridge	84
Desklink	96
Laplink Release III ☎	85
Software Bridge	72
VGA Dimmer	25

MEMORY MANAGEMENT

386 Max 5.1 Windows	\$69
Above Disk + 4.0	55
Headroom	67
Hyper Pad 2.0	79
Memory Mate	38
Move 'Em	46
PC-Kwik Power Pak v2.0	69
Qemm 386 ☎	59
Qram	48
Super PC-Kwik	44

MENUEING SOFTWARE

1 Dir Plus v.3.5	\$45
Auto Menu	35
Direct Access ☎	59
Power Menu	60

PRINT

Go Script	\$88
Go Script Plus	175
Impress 2:L	71
Print Q v5.0	83
Sideways 3.3 ☎	53

MONEY BACK GUARANTEE

Software Only - See Details. *

FORM PROCESSING

Form Filler 3.0	\$79
Formtool Gold 3.0 ☎	53
Formworks w/Fill & File	82
Perform Filler	76
Perform 2.1	79

1-800-622-6659

NOW ACCEPTING INTERNATIONAL ORDERS - Call our FAX at (602) 944-1510

VARs/Dealers - Call 1-800-537-6753

CORPORATE ACCOUNTS - Call 1-800-752-0561



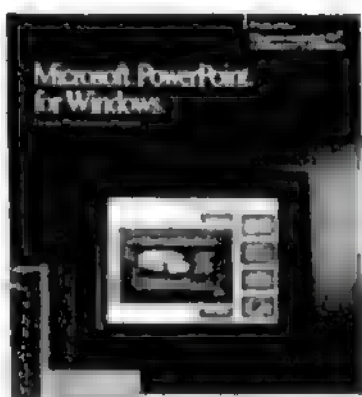
• No Charge for VISA and Mastercard.
• We Do Not Charge Your Card Until Your Order is Shipped.
• You Pay The Ground Shipping 1-10 # \$8.00 11-20 # \$12.00 (Except Alaska & Hawaii) We Pay The Air Difference and Free Air Applies ONLY to Domestic Orders Over \$100.
• Now accepting International Orders Call our FAX at (602) 944-1510
• International Orders Add 5%
• Call Before Submitting P.O.'s. Ask for National Accounts

• All products including D.O.A.'s carry only manufacturer's warranties. We do not honor guarantees, rebates, trial period privileges or promotional programs offered by manufacturers.
• No returns on used or misordered product.
• We do not guarantee machine compatibility.
• Machine compatibility disclaimer does not apply to MIT Systems.
• Personal & company checks will delay shipping 3 weeks.
• Prices, terms, availability & specifications are subject to change without notice.
• Add 5% for C.O.D. A.P.O. & F.P.O. Orders

• Mailing Address:
TELEMARK
8804 N. 23rd Ave., Phoenix, AZ 85021
• In Arizona Call (602) 944-0482.
• Order Line Hours: Mon-Fri 8am-10pm
Sat 8am-5pm, Sun 10am-3pm
• Order Processing (602) 944-1837
10am-3pm Mon-Fri
• Money Back Guarantee
Software Only
30 Days from date of invoice
Refund ONLY on Product Price
Product must be in resalable condition
Call for Return Authorization Number
Must be in original packaging
Software is the latest available version

PCM43091

Microsoft



Microsoft
PowerPoint
for
Windows

\$305

PERSONAL FINANCE

Money Matters v2.0	\$49
Quicken 4.0	36
Tobias Checkwrite Plus	28
Tobias Managing Your Money v.7.0	127
Wealth Builder	132
Wealth Starter	45

EDUCATION & TRAINING

Chuck Yeager Flight Simulator	\$18
Math Blaster Plus	28
Math Blaster Plus Mystery	28
Mavis Beacon Teaches Typing	30
MS Learning PC DOS	31
MS Aircraft Designer	25
MS Flight Simulator	39
PC Globe, PC USA	35 ea.
Personal Lawyer	34
Reader Rabbit	25
Typing Tutor IV Plus	27
Carmen San Diego	
Where in USA, World,	
Europe, Time	29 ea.
Carmen San Diego World Deluxe	45
Will Maker	34
Word Attack Plus	27

telemart

EXTENDED HOURS

Mon.-Fri. 6:00 am-10:00 pm MST
Sat. 8:00 am-5:00 pm MST
Sun. 10:00 am-3:00 pm PST

The Complete PC



CALERA

\$589

OPERATING ENVIRONMENTS

Carousel v5.0	\$48
Desqview 386	129
MS Windows Ver. 3.0	91

HOME OFFICE PUBLISHING

Express Publisher v2.0	\$85
Finesse	99
Newsmaster II	44
Newsroom Pro	24
PFS First Publisher	69
New Print Shop	35
Publish It! 1.2 w/Design	132

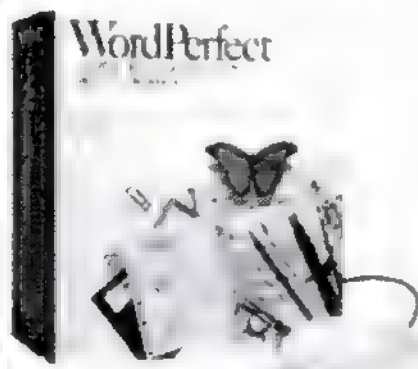
PROFESSIONAL DESKTOP PUBLISHING

AMI Pro	\$289
ATM	56
Freedom of Press	\$239
Glyphix for WordPerfect & MS Word	69
Pagemaker 3.01	489

DOS

Dr. DOS v5.0	135
MS DOS 3.3	\$69
MS DOS 4.01	69
IBM PC DOS 4.01	125

WordPerfect
CORPORATION



WordPerfect 5.1:
You asked for it!

- Tables feature—to generate charts, forms, and simple spreadsheets

\$245

WORD PROCESSORS

LetterPerfect	Call
MS Word	209
PC Outline	60
PFS Professional Write 2.2	142
Right Writer 4.0	53
WordPerfect 5.1	245
WordPerfect Office	Call
Wordstar 6.0	249

LIST MANAGEMENT

Address Book Plus	\$43
Avery Label Pro (Laser or Dot Matrix)	44
Avery List & Mail	28
Avery List & Mail Plus	36
Labels Unlimited	45

CAD & ENGINEERING

Auto Sketch 3.0	\$141
Design CAD 3-D	188
Generic CAD 5.0	225
Generic CAD Starter Kit Level II	89
Math CAD	305
Turbo Cadd	78
Summasketch 12x12 II	335
Summasketch 12x18 Pro II	
4 Button	582
Summasketch 12x18 Pro II	
16 Button	599

Microsoft



With Microsoft Project you can manage schedules and resources across projects.

\$425

ACCOUNTING

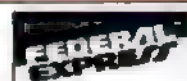
ACCPAC BPI	
AP, AR, GA, INV. Payroll	\$229
ACCPAC Bedford Accounting	147
ACCPAC Easy Gen. Acct.	53
DAC Easy Accounting 4.1	80
DAC Easy Bonus Pack 4.1	124
DAC Easy Payroll 4.1	53
One Write + Acctg. System	159
One Write + Payroll	62
Peachtree III	142
Peachtree III w/Data Query	211
Profitwise Acct. 10-Pack	129
TimeSlips III 4.0	185

GAMES

688 Attack Sub	\$19
Abrams Battle Tank	15
Chessmaster 2100	30
Falcon AT	30
Harpoon	36
Hunt for Red October	19
Leisure Suit Larry I, II, III	Call
LHX Attack Chopper	36
Playroom	25
Red Storm Rising	31
Sim City	28
Sim Earth	39
Their Finest Hour	38
Trivial Pursuit	24

FREE

FASTEST DELIVERY



FEDERAL EXPRESS
You Pay The Ground Shipping
We Pay The Air Difference

Microsoft



\$305

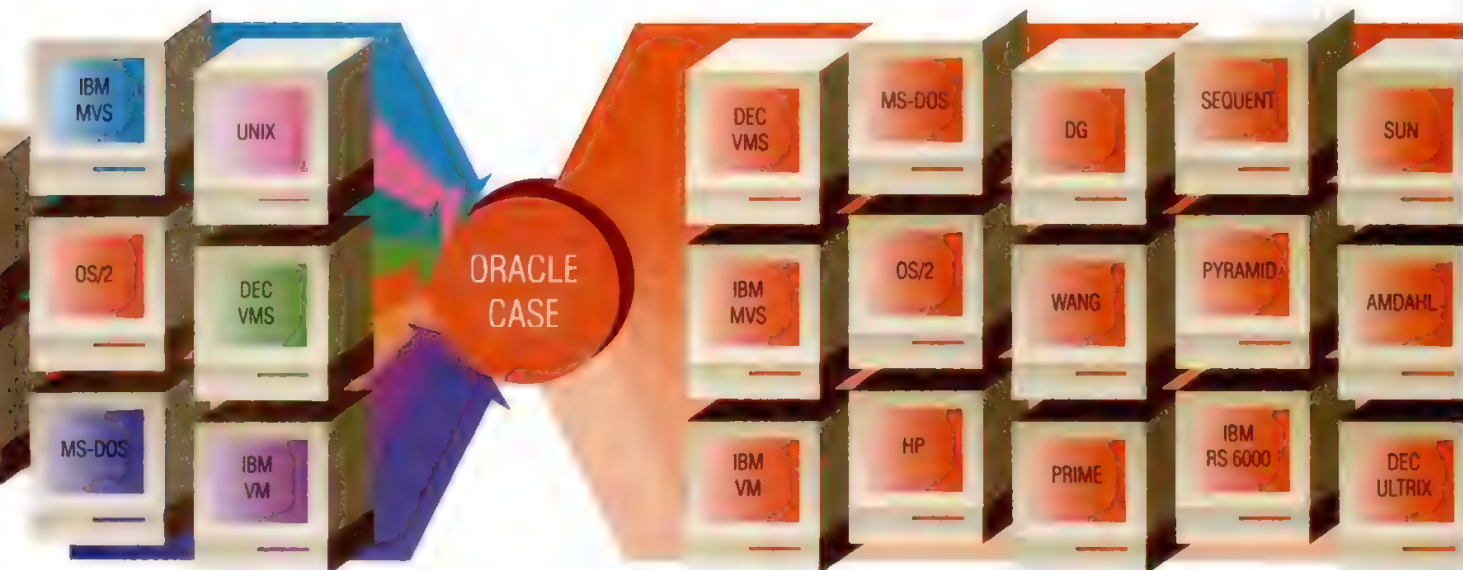
Where smart buyers find smart buys.

Only Oracle CASE allows teams of developers to jointly design and build database applications that run on virtually all the computers in your organization. Mainframes, minicomputers, workstations and PCs.

Oracle CASE supports the full lifecycle of systems development. From strategic planning, analysis and design to on-line generation, production and maintenance. Using sophisticated diagrammers for entity-relationship models, function hierarchies, dataflow analysis and matrices. All integrated with a comprehensive set of application development tools and utilities.

**Oracle CASE lets you
develop applications anywhere.
And run them everywhere.**

Developers' efforts are fully coordinated via a shared, on-line repository. Which can reside on virtually any platform, and be accessed by just about any combination of terminals and workstations. So developers can truly work as teams to improve productivity, while eliminating errors and redundancies.



And once CASE generates your application, you can run it on virtually all your computers. From PCs through mainframes. Oracle also offers comprehensive services to transfer our CASE expertise to you. Including full support, education and consulting to maximize your success with CASE technology.

1-800-633-0518 Ext. 4435

Call us now, and register for the free Oracle CASE Technology Seminar in your area.

You'll see why Oracle offers the best CASE scenario.

ORACLE®

Software that runs on all your computers.

© 1991 Oracle Corporation. ORACLE is a registered trademark of Oracle Corporation. All other trademarks referenced are the service marks, trademarks, or registered trademarks of the respective manufacturers. Call 1-800-ORACLE1 for hardware and software requirements. *In CANADA please call 1-800-668-8925 for product and seminar information.

William F. Zachmann



How Much PC Power Is Enough?

8088- and 80286-based systems remain popular for those on tight budgets looking to save a buck, but are these machines saving us anything in the long run?

Oddly, one of the questions about personal computers that generates some of the most emotionally partisan arguments is concerned not so much with the future as with the past. It is the question of the present adequacy of systems based on older processors such as the Intel 8088/86 or 80286.

There are those who vigorously assert that these older processors are effectively obsolete, that new purchases require at least an Intel 386SX, and that older systems ought to be replaced promptly with newer and more-powerful 386 and 486 systems.

On the other hand, there are those who defend the continued use and even purchase of 80286- or even 8088/86-based systems as more prudent and economical. These people claim that, desirable as newer, more-powerful systems may be, the older, less-powerful systems are often adequate to get the job done.

Of course, the reality is not nearly as simple as this "on the one hand...on the other hand..." summary might suggest. Not only the motives, but the arguments and heated responses on both sides are varied and complex.

Many, including most of my colleagues at *PC Magazine*, argue that the purchase and use of more-powerful 386 and 486 systems are simply a better investment. They point out that more software is starting to take advantage of the greater capabilities of these processors.

Those who own 8088s or 286s or whose budgets for new systems are severely constrained, however, often have a different view of the matter. While all agree that they'd be delighted to have a 33-MHz 486 with 8MB of memory and a 600MB hard disk, they point out that nobody is giving computers away and that such capabilities have their price.

Some go so far as to complain that those who advocate exclusive purchase and use of more-powerful 386SX, 386, and 486 systems are spoiled industry brats who fail to appreciate the real-world constraints of computer purchases and corporate budgets.

They note that even as prices of 386SX

systems fall, 286- (and 8088/86-) based system prices continue to fall even further. For individuals with tight budgets or organizations concerned about costs in a tough economic period, the continued premium for more-powerful systems, even though not large, remains significant.

The proponents of 286-based systems point out, too, (and not without justification) that less-expensive systems built around these older processors can still do the basic word processing and spreadsheet chores that most users really require of their computers.

Even those who are willing to consider more-powerful systems for new purchases may point out that there is already a substantial installed base of older systems in their company. "Do you seriously expect us simply to throw those systems away and spend thousands of dollars to replace them?" they ask.

In the most extreme form, a sort of class conflict among personal computer users exists where the XT and 286 "have nots" aggressively condemn the "privileged classes" with their fast 386 and 486 boxes. Advocates of operating environments like *Windows* or *Unix* are reviled as pampered yuppies out of



ILLUSTRATION: NED SHAW

touch with what the "working classes" of the PC revolution are able to afford.

Personally, I must confess to being a strong partisan of more-powerful systems. No personal computer can be too powerful, have too much memory or disk storage, too fast a processor or disk, or too high a screen resolution. Fortunate to be able to afford more-powerful systems, I find even the speed of a DIR listing on a 12-MHz 286 intolerably slow.

William F. Zachmann

Further, I think that the argument that a faster, more-powerful system is a better long-term investment is fundamentally sound. Just as I argued a few issues back, that a large case with lots of future expansion room and upgrade potential is desirable, I also believe it generally makes

sense to buy the most powerful system one can afford.

Nevertheless, I am more than sympathetic to those who are unable or unwilling to pay extra for more power than they think they need (or can afford) now. Those of us who evaluate and assess new technology and future directions often fail to appreciate fully the restraining effect of past purchases on many users.

The Fastest Small Business LAN Is Invisible.



As it should be. A LAN's moment of truth is its ability to access data fast while remaining invisible, easy to use. And it should take up little, if any, of your DOS memory. So there'll be plenty available for processing tasks.

With speed in mind, we designed new super-swift Net/30 2.0 software. How fast is it? At least 30% faster than our nearest competitor. And about 60% faster than the rest of the pack.

To help you squeeze more from your DOS memory, we were first to introduce expanded memory support. And we're still the only network offering expanded memory

managers as part of the operating system. This lets you load the network plus your TSR programs outside conventional memory. In fact, you can actually *add* to the 640K DOS memory capacity.

The Invisible Network™ comes complete with hardware and software. And all the tomorrow-minded features come standard. For more information, call 415-570-5967, or Fax 415-570-6017.

Invisible Software, Inc., 1142 Chess Drive, Foster City, CA 94404



CIRCLE 228 ON READER SERVICE CARD

For an individual who spent a few thousand dollars of hard-earned money for an 8088- or 286-based system a few years ago, or an information systems manager looking at an inventory of hundreds or thousands of such systems, the luxury of being able simply to walk away from past purchases often just isn't there.

CHANGING HOW WE WORK

Particularly in more difficult economic times—when many businesses are cutting back on expenditures and even laying people off—buying the latest and most powerful systems to replace old ones that still work and get the basic job done can be hard to justify.

That is why I so often emphasize the importance of the shift from using PCs primarily as personal productivity tools to using them and microprocessor-based systems in general as replacements for traditional mainframe systems in enterprise computing.

While the emphasis is solely on individual productivity applications, the desire of many people for newer more-powerful systems will not overcome the restraining influence of tight budgets in increasingly tough times. Only, it seems to me, if acquisitions of those more-powerful systems are substantially linked to offsetting savings in expenditures on traditional systems will there be adequate corporate support for purchasing these newer, more-capable systems.

There *are* good arguments in favor of buying new systems with sufficient power and capability to provide "headroom" for future expansion. Those who save a little today by purchasing less-powerful systems will often spend more in the long run, as they are forced to upgrade much sooner than those who paid more for a more-capable system at the start.

However, those of us who advocate buying the latest and greatest systems merely to disdain those buying "brain damaged" systems instead, aren't very helpful.

Rather, we must appreciate the very real constraints in the budgets of these companies and individuals, and where applicable, show them the concrete benefits that more-powerful systems can provide. Not the least of these are the ability to take on at least some of the enterprise computing tasks that, for the most part, still remain on much more expensive mainframe and minicomputer systems. ■

Weight Conscious.

Go Places With Our 386⁺ SX-16 Notebook.

- ☐ 1MB of high speed memory expandable to 5MB on board
- ☐ Backlit supertwist LCD display with VGA resolution
- ☐ Supports 640 x 480 resolution with 16 gray shades, 80 characters x 25 lines
- ☐ 20MB hard disk drive & 3.5" 144MB floppy drive
- ☐ 1 parallel and 1 serial port, VGA and keyboard ports
- ☐ 80 key full size keyboard
- ☐ MS DOS 4.01
- ☐ NiCad battery & AC power/auto recharging adaptor

\$2095

SX-16 is a trademark of Intel Corporation


If you're always on the go, we can help. Introducing our new compact, 7 pound notebook size laptop.

Fast, Fit and Trim.

This 386/SX-16 notebook is nearly twice as fast as a 286/12. And, it's equipped with 1MB and is capable of handling 386 software with ease.

Don't let size fool you. It's packed with 386[™] power, a 20MB hard disk, a 3.5" floppy, and a CCFT, backlit supertwist LCD panel with 640 X 480 VGA resolution. It has a full size keyboard and we include MS DOS 4.01.

800/662-6111

Get a full three hours from the NiCad

battery pack that recharges while you're using the AC adaptor. And, when the batteries are getting low the LED indicator/beeper system will let you know.

Total Health Care.

All Standard products carry our 30 day, no questions asked, full refund guarantee. One year parts and labor warranty and the Standard lifetime toll-free customer service hotline are also included.

So, join the weight conscious generation. Call us. We'll lighten your load. It's just the Standard thing.

STANDARD

C O M P U T E R

12803 Schabarum Avenue, Irwindale, CA 91706

Phone 818/337-7711 FAX 818/337-2626

CIRCLE 297 ON READER SERVICE CARD



Cache Conscious.

Powerful 386 $\blacktriangledown$ 25 Cache System.

- ☐ 128K cache memory expandable to 256K
- ☐ 4MB of 32-bit high speed memory expandable to 16MB on-board
- ☐ High performance 1024 x 768 VGA with 256 colors including 1MB of 32-bit video memory
- ☐ 14" Super Hi-Res .28mm dot pitch VGA color monitor with tilt/swivel base
- ☐ 100MB 17ms IDE hard drive with 64K "look ahead" cache buffer
- ☐ 1.2MB 5.25" & 1.44MB 3.5" floppy drives
- ☐ Six 16-bit expansion slots available
- ☐ MS DOS 4.01
- ☐ Windows 3.0 & Hi-Res mouse

\$2595



If you crave power, speed, and flexibility, this is it. Our 386 $\blacktriangledown$ systems have 128K cache, 4MB of 32-bit RAM and super fast processing speed.

You'll power through the new multi-tasking programs

with ease. And, with our 100MB hard drive and 64K "look ahead" cache buffer, you can load in all those programs you've been collecting.

The Most In Reliability, Service & Support.

- | | |
|--|---|
| ☐ Fully integrated system board includes I/O controller, cache, RAM expansion, video controller, and drive controller | ☐ 30-day, no questions asked, money-back guarantee |
| ☐ System board designed and made in U.S.A. by Standard Computer | ☐ One year parts and labor warranty |
| ☐ FCC class B approved | ☐ Free one year on-site service in qualified areas |
| | ☐ Lifetime toll-free customer service hotline |

Call About Our Other 486, 386, SX & 286 Systems.

All this power and performance is displayed on a crisp Super VGA screen capable of creating images in 256 beautiful colors.

For more power, upgrade the cache memory to 256K, add a coprocessor, boost on-board RAM to 16MB or expand hard disk



Cash Conscious.



Affordable 386SX-16 System.

- ☐ 2MB of high speed memory expandable to 8MB on-board
- ☐ High performance 1024 x 768 VGA with 256 colors including 1MB of 32-bit video memory
- ☐ 14" Super Hi-Res .28mm dot pitch VGA color monitor with tilt/swivel base
- ☐ 40MB IDE hard disk drive
- ☐ 1.2MB 5.25" & 144MB 3.5" floppy drives
- ☐ Four 16-bit expansion slots available
- ☐ 1 parallel and 2 serial ports
- ☐ 101-key enhanced keyboard
- ☐ MS DOS 4.01
- ☐ Microsoft Windows 3.0 & Hi-Res mouse

\$1795

capacity to a gigabyte.

On the other hand, if you're looking for the perfect

800/662-6111



blend of price and performance, try our 386/SX. With high resolution VGA, highly integrated system board and zero wait state memory, this system is not only affordable, it's powerful.

With 2MB of RAM, expandable to 8MB on-board, and a 40MB IDE hard drive, our 386/SX systems can

easily handle the latest software. DOS and Windows are preloaded and a high resolution mouse completes the package.

All systems carry a 30-day, no questions asked, refund. Plus one year parts and labor warranty. On-site service in qualified areas and our toll-free customer service hotline are included at no extra charge.

So, if you're cash conscious or cache conscious, give us a call. We'll fit you with a system, fast. It's just the Standard thing.

STANDARD
COMPUTER

12803 Schabarum Avenue, Irwindale, CA 91706
Phone: 818-337-7711 FAX 818/337-2626
CIRCLE 163 ON READER SERVICE CARD

TECHNOLOGY: IT'S ALL IN THE ATTITUDE.

Fast, Error-Free Modems By Cardinal

We share your attitude about technology.

The real reason for technology is to make your job easier.

To give you the time to do what you like to do. That's what you expect. And it's why Cardinal creates original technologies that deliver beyond your expectations.

All Cardinal modems use proven technology – MNP® Class 1-5 error correction and data compression – to achieve quicker, error-free communications. Some models have the capability designed right into the hardware. For others, we use our own unique FLASHlink™ software. That means every Cardinal modem can boost exchange rates up to two times, and our new V42 Series up to four times!

MIS Director

Third Degree Black Belt
Hates errors. Likes speed.
Cardinal modem user.

Proven technology. Original designs. Superior performance. Made in our own factory right here in the USA. They're all part of the Cardinal attitude.

For more information about Cardinal's full line of modems, or any of our other computing products, call your local dealer or (800) 233-0187 today.

	9600 V42		9600 V32		2400 V42		2400 V32		2400 V42P		4800 V42		4800 V32		4800 V42P		9600 V42P		9600 V42P	
External/Internal	EXT	INT	EXT	INT	EXT	INT	EXT	INT	EXT	INT	EXT	INT	EXT	INT	EXT	INT	EXT	INT	EXT	INT
FLASHlink Communications Software	opt	yes	opt	opt	yes	opt	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Front panel LED's	yes	n.a.	yes	yes	yes	n.a.	yes	n.a.	yes	n.a.	yes	n.a.	yes	n.a.	yes	n.a.	yes	n.a.	yes	n.a.
Selectable COM Ports (1-4)	n.a.	yes	n.a.	n.a.	yes	n.a.	yes	n.a.	yes	n.a.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
MNP (up to Level 5) in Hardware	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
MNP (up to Level 5) in Software	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
CGIT V.42/bis	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Maximum Data Throughput (bps)	38,400	19,200	9600	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800
SENDAX Capabilities (bps)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Hayes® AT Command Compatible	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
PRICE	\$699	\$599	\$249	\$229	\$199	\$199	\$199	\$199	\$199	\$199	\$199	\$199	\$199	\$199	\$199	\$199	\$199	\$199	\$199	\$199

*Enhanced, multi-function V.42 products.
*Micro Channel Architecture compatible. Selectable SERIAL ports 1-4.



Cardinal™

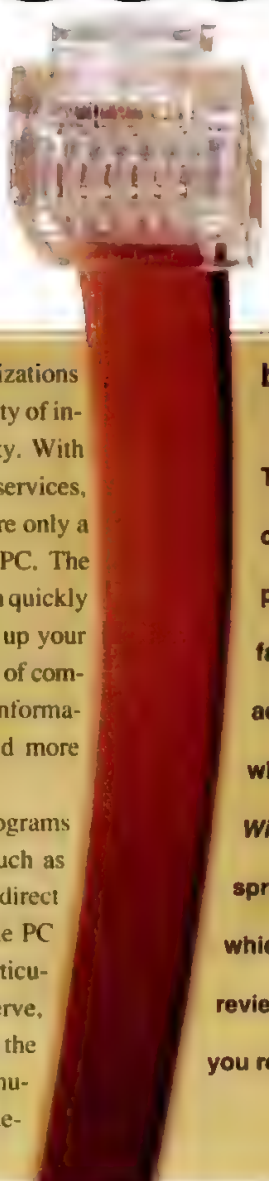
Where Originality In Technology Begins.
CIRCLE 319 ON READER SERVICE CARD

1827 Freedom Road, Lancaster, PA 17601 • (800) 233-0187 • (717) 293-3000

All names, products and services mentioned are the trademarks or registered trademarks of their respective organizations.

Asynchronous Communications Software

Improving Information Access



The problem many organizations face is not the availability of information, but its accessibility. With the rapid growth of on-line services, vast amounts of useful data are only a phone call away from your PC. The problem is getting information quickly and accurately without tying up your machine. The latest generation of communications software makes information access easier, faster, and more convenient.

Many communications programs specialize in a single task, such as unattended file transfers, direct mainframe access, and remote PC operations. Others access particular services like CompuServe, GENie, and MCI Mail (see the sidebar "Tailor-Made Communications"). Still another category offers communications

by Mike Byrd

The latest asynchronous communications software packages can make it easier, faster, and more convenient to access and transfer information, whether you work in DOS or Windows. But with a price spread of \$30 to almost \$300, which of the 17 programs we review have the features you really need?

libraries you can add to database applications, allowing them to dial up a host database and exchange information (see the sidebar "Communications for Databases").

Finally, there are many general-purpose communications programs, but not all support the latest techniques for fast, accurate information transfers. The term *general-purpose* implies that the program can connect with a variety of other systems. These programs emulate terminals, transfer files, and automate operations, allowing you to connect with bulletin board systems (BBSs), mainframes, on-line services, and other PCs.

REVIEW CRITERIA

For this review, we evaluated general-purpose communications programs that include the ZModem file-transfer protocol and either run under *Windows* or implement the first in, first out (FIFO) buffer mode of the 16550A Universal Asynchronous Receiver/Transmitter (UART).

UART chips control the serial port. During modem communications, the PC's UART and the CPU transfer a great deal of information. ZModem is the de facto standard protocol for BBS file transfers; there is also a version available for mainframes. It is one of the fastest and most accurate file transfer protocols. Along with ZModem, support for newer UARTs can help organizations access files and information with less delay. In our recent modem reviews ("9,600-bps Modems: Breaking the Speed Barrier," December 11, 1990, and "2,400-bps Modems: Affordable Access," March 26, 1991), we found that the UART on your serial board or internal modem may be the bottleneck precluding fast, accurate data transfers when you use a high-speed modem or operate in a multitasking environment.

The 16550A UART directly supersedes the older 8250 or 16450 UARTs found in most PCs. Its FIFO buffers can handle the rush of data from the high-speed modem connection (high speed is typically 19.2 Kbps and higher), and pass it smoothly to the PC's CPU. To take advantage of the 16550A UART's buffer mode, the communications software must first activate the buffer and efficiently handle its 16-byte capacity. We've provided a utility program you can use to experiment with the 16550A buffer in a limited way (see the sidebar "The 16550A UART: Breaking Old Bottlenecks").

Our research found 17 general-purpose communication programs that meet these criteria, priced from \$30 to \$295. They are *BLAST PC*, *COM-AND*, *Crosstalk Communicator*, *Crosstalk for Windows*, *Crosstalk Mk. 4*, *DynaComm Asynchronous Edition*, *HyperAccess/5*, *Mirror III*, *MTEZ*, *PereLine*, *ProComm Plus*, *Professional YAM*, *QModem*, *Smartcom Exec*, *Telnet*, *Unicom*, and *WinComm*.

COM-AND, *QModem*, *Telnet*, and *Unicom* are shareware; they are highly capable, widely used, and generally competitive in features with commercial products. You can legally copy these programs from a friend or download them from bulletin boards and on-line services. You'll find copies of these programs in library 11 of PC MagNet's Utilforum/Tips forum (GO PCM:TIPS) and in library 3 of CompuServe's IBM Communications forum

It takes a lot of
CPU power to run
asynchronous
operations while
running other
applications.

(GO CIS:IBMCOM). To locate the specific files, go to one of these libraries and type BRO KEY:xxxx, where xxxx corresponds to the program name.

If you decide to use these programs, you pay a modest registration fee—typically between \$30 and \$60, much less than a commercial package. There are a few reasons why an organization might prefer a more costly commercial product to one of these shareware offerings. One of the most important is that many organizations don't want to run the risk of being left with an unsupported "orphan," which is more likely to happen with a shareware product than with a commercial one backed by an established vendor.

Interestingly, several major commercial communications products—*Crosstalk XVI*, *Smartcom III*, *Relay Gold*, and *MicroPhone II for Windows*—still don't include ZModem and 16550A UART support, but are so widely used that they can't

be ignored (see the sidebar "Communications Without ZModem: Old Standards and a New Favorite"). Another interesting package is the *Windows*-based *ObjectTel*, which contains some unusual features. A version of it is available in France, but it should be shipping in the United States by the time you read this (see the sidebar, "ObjectTel: Communicating the French Way").

WINDOWS COMMUNICATION

The *Windows* Terminal program, written by Future Soft Engineering (the same company that makes *DynaComm Asynchronous Edition*), is a no-frills utility with the ability to move files between PCs using XModem and Kermit protocols. It also provides a few basic terminal emulations—DEC VT100, VT52, and ANSI. A simple Teletype-like screen displays characters as it receives them. It's useful, but not elegant.

The programs in this review designed for *Microsoft Windows* 3.0 can all do tasks under the control of scripts while operating in the background mode, accessing information while you continue other work. It takes a lot of CPU power to run asynchronous operations while running other applications. Well-behaved *Windows* applications are supposed to let the communications driver handle the job of interacting with the hardware.

Unfortunately, the COMM.DRV in *Windows* 3.0 is a mediocre product. It does not support the FIFO buffer in the 16550A UART, it uses nonstandard addresses for COM3 and COM4, and it is limited to a slow throughput of 19.2 kilobits per second—probably to save some CPU power for other applications. One product, *WinComm*, circumvents the COMM.DRV to address the UART directly for faster throughput, but this approach risks compatibility problems with other programs running under *Windows*.

A more acceptable option should be available by the time this article reaches print. Hayes Microcomputer Products and other companies plan to ship a *Windows* driver for Hayes's Enhanced Serial Processor (ESP) card that will replace Microsoft's COMM.DRV. The Hayes ESP board includes two serial ports for simultaneously sending and receiving data. The board also features an Intel 8031 coprocessor, 1K of buffer memory, and Hayes's Enhanced Serial Interface (ESI), which together allow incoming data to be sent directly to a PC's memory, taking the

processing burden off the computer's CPU and increasing allowable throughput. The board sells for \$299; for the PS/2, Model 50 or higher, it costs \$349.

PERFORMANCE DIFFERENCES UNDER DOS

There are big differences in the performance of these products, particularly the character-based ones. Set to run at 115.2 kilobits per second on the Character-Based ZModem benchmark test, these products delivered throughput ranging from 49.61 Kbps at the high end to 5.43 Kbps at the low end, with some products not being able to handle that speed at all. Packages with good throughput are more likely to be useful in future ISDN and LAN communications applications.

Hayes's *Smartcom Exec* stood well above most competitors in terms of throughput and reliability, particularly during file transfers. Digital Communications Associates' *Crosstalk Mk. 4* and *Crosstalk Communicator* also turned in across-the-board results that, on the whole, outshone their competitors. These programs gain speed by their designers' efficient handling of the RS-232 flow control signals, UART data buffers, and other I/O functions. While the throughput in most communications sessions is limited by the modems and not by the communications software, the maximum throughput you can get from a program with a hardwired connection (which is how we ran our performance tests for the products in this roundup) is a good measurement of the data-handling efficiency and CPU workload. We ran the tests of the character-based programs with one machine using an 8-MHz 80286 microprocessor specifically to see how efficiently the software uses the CPU.

FILE-TRANSFER PROTOCOL TECHNIQUES

One obstacle to accessing information over the phone lines is line noise, which can mask the tones carrying the data between modems and cause errors. Since error-controlling modems are relatively new, file-transfer routines in software were first developed to provide modems with error control.

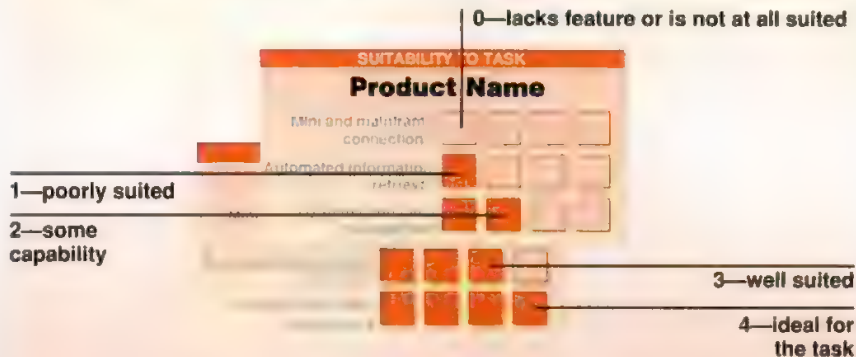
You might depend on a particular protocol for most transfers, but if you connect to PCs running different communications programs, it's good to have a wide variety of protocols at your fingertips.

COMMUNICATIONS ASYNCHRONOUS



COMMUNICATIONS SOFTWARE: SUITABILITY TO TASK

PC Magazine assesses each communications software package's suitability in three areas—mini and mainframe connections, automated information retrieval, and systems and calls management—and assigns a point value for each one. These subjective ratings, on a scale from 0 to 4, are presented along with each review and translate as follows:



Mini and mainframe connections is a rating of the product's ability to connect to mini and mainframe computers and download data from them.

Automated information retrieval measures the efficiency with which the package automates the retrieval of

information from different on-line services, such as MCI Mail and CompuServe.

Systems and calls management rates how well the product keeps track of calls and file transfers, and how well it monitors the time and expense involved in calling systems and other PCs.

Most file-transfer protocols send the data in packets with some form of error detection, often either *checksum* or *cyclic redundancy check (CRC)*. Both the checksum and CRC are values derived from the data according to mathematical algorithms. The protocol sends the value along with the bits in the packet. The receiving program looks at the received data and compares the check values with the values it calculates. If the check values do not agree, the receiver asks for a packet retransmission.

Most older protocols require a positive acknowledgement that the check values agree before sending another packet. Some newer protocols allow transmission of multiple packets before receiving acknowledgement of the first packet. This type of *windowed* protocol is particularly useful on communications circuits with long delays, such as satellite links. If a *sliding windows* protocol detects an error, it retransmits only the packet in error. *Streaming* protocols transmit an entire file before they wait for an acknowledgement.

PROTOCOL TYPES

The size of a packet affects the overall file-transfer throughput. Small packets require more overhead but are easier and faster to retransmit. Large packets yield higher throughput unless they experience a large number of retransmissions.

The simplest file-transfer protocol is dumping an ASCII file out the serial port. The computer essentially "types" a file to the serial port with no error detection.

One of the most widely used protocols is XModem, also known as Christiansen protocol. Each XModem block has a fixed size of 128 bytes with a block number and checksum added. A simple protocol and one of the first in the public domain, XModem has spawned several variations. These differ primarily in the error correction protocol; in fact, you can get into a lively debate over which is the "real" XModem. Its popularity derives from its widespread distribution, although it is one of the slowest protocols available.

XModem 1K is a version of XModem that uses blocks of 1,024 bytes. Many programs refer to XModem 1K as YMod-

em. But as originally written, YModem also adds a batch-file capability so you can perform multiple file transfers in a single operation. Adding to the confusion, many programs refer to this original version of YModem as YModem-Batch. (In the features chart, we listed the file-transfer choices as specified by the vendor.) YModem-G, a streaming variation of YModem for use with error-controlling modems, detects errors but does not correct them. If you encounter an error using YModem-G and error-controlling modems, most likely it is not an error in transmission, but an error between the modem and the PC.

Kermit, developed at Columbia University, allows 7- or 8-bit binary and ASCII file transfers. It is the de facto standard for mainframe communications. Despite many variations, one of Kermit's strengths is its ability to negotiate a common level of features between different versions. It can also adapt its block size to the data, but this frequently adds more overhead than XModem. Depending on the implementation, Kermit may yield less throughput than XModem.

ZModem, the first choice for most BBSs, features relatively low overhead and significant reliability and speed. ZModem dynamically adjusts its packet size depending on line conditions, and uses a very reliable 32-bit CRC error check. With its file-recovery feature, if ZModem aborts a transfer, it can reinitiate it from the point the abort occurred without resending the entire file. Several of the communications products we reviewed can autostart a ZModem transfer, automatically choosing ZModem when they recognize a download command.

ZModem is in the public domain, but the originator, Omen Technology, continues to improve its capabilities in an external protocol called *DSZ*. Some comm programs allow you to add external file-transfer protocols by shelling to DOS and running a program to enable the protocol. Others allow you to install the external protocol directly on the communications program's menu. *QModem*, *Crosstalk Mk. 4*, *Mirror III*, and *PereLine* are among the programs that can transparently pass control to an external protocol. The latter two use the *DSZ* protocol.

Some users object to the overhead of creating a DOS shell, but external protocols let you take advantage of the latest improvements of a protocol program.

Mirror III and *MTEZ* also implement

the MNP (Microcom Networking Protocol) error control and data compression protocols in software. Even if you do not have an MNP modem, you can use these products to make an MNP link with an MNP-equipped system on the other end. MNP offers the advantage of reducing line noise appearing on your screen and potentially increasing your speed.

**ZModem is in the
public domain, but
Omen Technology
continues to improve
its capabilities.**



INSTALLATION AND USE

Almost all of the communications packages include an installation program that asks you a few questions about your hardware configuration, particularly about the type of modem attached to your PC. If the installation program lists your modem on one of its setup menus, you normally won't have problems getting your software to talk to the modem using commands the modem recognizes. If the program does not directly support your modem, the setup menus frequently contain generic settings that will work with modems using the command sets for Hayes, U.S. Robotics, or Microcom modems.

In a few cases, you will have to manually input the setup strings for your specific modem. This isn't difficult, but it requires careful reading of the manuals for the software and the modem. It's also a good idea to contact the modem or software vendor and ask for advice.

One of the more time-consuming setup tasks involves creating the phone book. For each entry, most programs require you set a maximum port rate, parity, number of data bits, and stop bit. If you do not use an error-controlling modem or software, set your port rate to the slower of the maximum rates supported by either the system you're calling or your own system. If you use an error-controlling system, specify a port rate at least double

the anticipated connection speed. Most BBSs use 8-N-1 for data bits, parity, and stop bit respectively. In this case, N means no parity. CompuServe's specifications are 7-E-1, where the E is even parity. Gathering the information about the systems you call usually takes longer than inserting it in the program's configuration file.

SCRIPT LANGUAGES

These programs' script languages provide the key to automating repetitive communications tasks. Many users typically rely on scripts to automate their log-ons to dial-up on-line services and BBSs. Most programs have a learning feature that records the stream of incoming data and your responses. The learning feature then generates a file to repeat your responses at appropriate times.

Most script languages are patterned after a higher-level computer language like Pascal or C. Some, like *Crosstalk Mk. 4*'s language, offer compilers that allow you to optimize the scripts for performance.

Only your imagination and programming skills limit what you can do with a script. You can write games in script languages, or elaborate applications that automatically check stock prices and news wire services. Scripts can not only log on to a service, they can automatically dial up the service at a specified time, log on, download files and messages, and hang up—all without your intervention.

TERMINAL EMULATIONS

Terminal-emulation options give the PC the ability to respond to the special screen-formatting commands and characters coming from the computer at the other end of the communications link. Many programs have a half-dozen or more built-in emulators, but typically you need only one or two specific emulations in your application.

When you connect to other PCs and most BBSs, you normally select the TTY or ANSI terminal emulations. ANSI terminal mode gives the called computer the ability to display color, reverse, and flashing text on your screen, plus some graphics. Many terminal emulations support connections with larger computer systems such as mainframes, allowing you to access their wide-ranging databases and e-mail systems in your search for information.

One of the biggest problems encount-

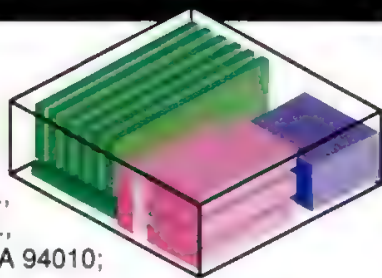
A Winner.

We didn't say it.
PC Magazine did.



FACT FILE

EDITORS' CHOICE



Tangent 386SX/20

Tangent
Computer, Inc.,
303 Beach Rd.,
Burlingame, CA 94010;
(800)223-6677,
(415) 342-9388.

List Price: With 1MB RAM, 1.2MB 5.25-inch or 1.44MB 3.5-inch floppy disk drive, one parallel and two serial ports, VGA monitor, \$1,644; with 2MB RAM, 60MB hard disk, DOS 4.01, \$2,278; with 105MB hard disk, \$2,384.

In Short: An excellent contender with above-average electronics and hard-working peripherals, the Tangent 386SX/20 adds an FCC Class B certification to the pile to make it an extremely attractive computer for either home or office.

"The 20 MHz 80386SX is the new entry-level business system of choice, starting right now."

PC Magazine

Best choice of the best choices.

Here's how PC Magazine summed up the Tangent 386TMSX/20 (Tangent's Model 320s):

"The Tangent 386SX packs outstanding video, expandability to 8 MB, and plenty of free slots into a nicely reduced-size case. The price is right too. This PC offers a 105 MB hard disk and Orchid's ProDesigner II Super VGA card for a mere \$2295. Add in clear documentation and on-site service (with Tangent's one-year warranty) and you have a solid winner."

"The Tangent 386SX/20 is the best of the show; it garnered top scores in all of our video tests."

A system with a future. The Tangent 386SX/20 runs all of yesterday's programs. All of today's. And most important, tomorrow's. Because it implements the full Intel 80386 feature set.



Standard Configuration:

- Intel 20 MHz 80386SX CPU **\$2295**
- 2 MB of Memory (to 8 MB)
- 105MB 17ms Quantum Hard Disk
- Orchid ProDesigner II SuperVGA Card
- 14" SuperVGA Color Monitor
- Small Footprint Case w/200W Power Supply
- 5.25" or 3.5" High Density Floppy Drive
- Coprocessor Socket
- One Parallel, Two Serial, One Game Port
- 101-key Enhanced Keytronics Keyboard
- One-year Warranty with On-site Service



November 27, 1990
Tangent 320S

Why buy their computer, when we'll build yours?

High performance. Low price. Tangent offers you a complete line of high performance systems: 20 MHz 80386, 25 and 33 MHz 80386SD, and award winning 25 and 33 MHz 80486. All, at what some people think is the best price-to-performance ratio in the business.

Built your way. Dealing with Tangent is like owning your own computer factory. Tell us exactly how you want your system configured, we'll build it, test it, and ship it. Your way. And even though it's your configuration, it carries our one-year warranty.

PC Magazine's windup: "Add an FCC Class B rating and a one-year warranty on parts and labor that includes on-site service into the bargain, and you begin to suspect that the Tangent 386SX/20 is a winner. Consider the price/performance ratio of the computer and that suspicion starts to look like a certainty."

Bill O'Brien, PC Magazine, 11/27/90

Thanks Bill. We couldn't have said it better.

Order now, Toll Free:

1-800-223-6677



TANGENT
COMPUTER

197 Airport Blvd. Burlingame, CA 94010
Phone: 415/342-9388 FAX: 415/342-9380

CIRCLE 391 ON READER SERVICE CARD

*All pricing subject to change without notice. ©1990 Tangent Computer. Tangent is a registered trademark of Tangent Computer, Inc. 386 is a registered trademark of Intel Corporation. Other product names may be the trademarks or registered trademarks of their respective companies.

COMMUNICATIONS ASYNCHRONOUS

tered with terminal emulation software is the keyboard remapping. For example, the keyboards on IBM and DEC mainframes contain many keys not found on PC keyboards. To emulate those keys, the software must remap one or more of the PC's keys to return the character sequence the mainframe expects. Since most terminal emulations do not fully represent the emulated keyboard, you should test the terminal-emulation features of any program to be sure they meet your needs.

Emulating a terminal's video display also creates problems because many expensive terminals feature better line reso-

lution than PC video systems. Some terminals support a 132-column mode that seldom looks good on a PC's screen—the characters get jammed when brought down to the PC's screen. A terminal may also offer a different graphics character set that the emulation needs to remap.

NETWORK COMMUNICATIONS

When IBM first designed the PC, its engineers used Western Digital's 8250 chip for the serial-port controller. The designers of the PC's ROM BIOS rou-

tines provided a set of software routines that programmers could use to communicate with the serial ports. Programmers can access these routines by invoking interrupt 14h, or INT14.

Unfortunately, the INT14 routines included in the PC's ROM BIOS aren't of much use to designers of communications software because they don't support the speeds needed to communicate with modems efficiently. Designers of most PC communications software get good performance by addressing the PC's UART directly, bypassing the INT14 routines.



EDITORS' CHOICE

- *Crosstalk Mk. 4*
- *Smartcom Exec*
- *DynaComm Asynchronous Edition*

The asynchronous communications programs available today come in a range of flavors, prices, and capabilities. We reviewed 17 programs—4 shareware and 13 commercial. Of these 17, four products were *Windows*-based; the others operate in character mode. All support the ZModem protocol, one of the fastest and most accurate file-transfer protocols. The character-based products also implement the first in, first out (FIFO) buffer mode of the 16550A Universal Asynchronous Receiver/Transmitter (UART). Prices ranged from a \$30 to \$45 registration fee for the shareware packages, and from \$100 to \$300 for most of the commercial programs. The Editors' Choices honor *Crosstalk Mk. 4*, *Smartcom Exec*, and in the *Windows* arena, *DynaComm Asynchronous Edition*.

Digital Communications Associates' *Crosstalk Mk. 4*, with its array of 21 terminal emulations, flexible network communications capabilities (it supports INT14, Novell NASI, and NetBIOS), extensive script language consisting of over 300 verbs, an easily configurable front end, 40 predefined modem setup strings, and excellent documentation, proves a clear choice for anyone looking for a powerful communications program. On top of that, *Crosstalk Mk. 4* proved to be one of the faster products we reviewed, generally providing throughput that ranked it high in the

second speed tier on our Character-based ZModem performance tests. When using its proprietary DART protocol, its speed was even more remarkable. Although its \$245 price is somewhat higher than that of many other packages, it's a real bargain for all it accomplishes. Corporate managers who require features like a powerful script language, a variety of terminal emulation selections, and network communications capabilities will appreciate this product.

Not everyone needs the power of a program like *Mk. 4*, or wants to pay the price for it. For users who don't, the one product that clearly beats its competitors is Hayes' \$129 *Smartcom Exec*. It proved the fastest of all programs on our Character-based ZModem performance tests, and received exemplary scores on the Professional YAM tests. There, it trailed only slightly behind *ProComm Plus*, but the latter's inability to perform the Character-based ZModem tests at 57.6 and 115.2 Kbps gives *Smartcom* the edge. While the terminal emulations and file-transfer protocols on its menus are not as all-inclusive as some other programs, *Smartcom Exec* allows users to share modems across some LANs, supports the Hayes Enhanced Serial Processor card, and boasts simple operation. Additionally, while its own script language is rather extensive with 191 verbs, it also allows users to use scripts developed in Hayes' higher-

end *Smartcom III*. If you're an individual user looking for features like nicely thought-out phone directories, ease of use, and flexibility, this product will meet your needs.

If you're a *Windows* user, you'll want a product that implements dynamic data exchange (DDE) to move data between *Windows* applications, as well as a product that takes advantage of other features of a graphics environment. Even though it doesn't graphically represent file transfers as well as some other *Windows* programs do, *DynaComm* makes good use of icons, constructing them to convey a great deal of information at a glance. It also includes a robust script feature, a good number of terminal emulations, and its own text editor. It was the only one of the *Windows* programs to offer INT14, Novell, and NetBIOS support. Companies with multiple platforms will appreciate that the product also comes in versions for OS/2 and the Macintosh. *DynaComm* carries a high \$295 price tag, but for *Windows* users, it's money well spent.

The \$99 *Crosstalk Communicator* provides a fast, flexible alternative for the budget-conscious, particularly anyone in an organization already using *Crosstalk Mk. 4*, because it can use scripts developed in that program. While shareware products may be less expensive, *Communicator* is one of the best price/performance options available.

Out of the prairie comes proof that a higher level of communication has arrived.

Presenting the New Version of PROCOMM PLUS.

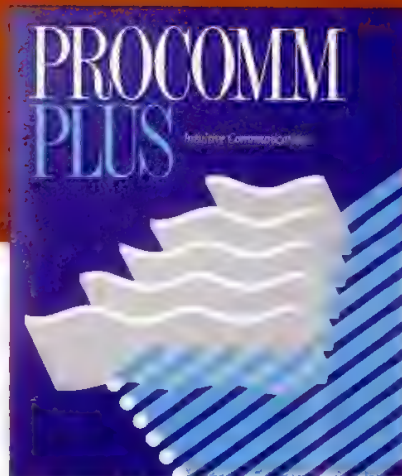
Leaving a very big impression on the field of communications is what PROCOMM PLUS has always done best. But today, it's done one better.

PROCOMM PLUS 2.0. The new version of the best-selling communications software in the world. With internal Zmodem, an enhanced ASPECT script language with hundreds of new commands, and script compiling for much faster execution speed; an enhanced dialing directory with many new features; a time-saving Filename Clipboard (Patent Applied For); 33 terminal emulations with 132 column and full EGA/VGA support; and much more.

If you own PROCOMM PLUS, you can upgrade to PROCOMM PLUS 2.0 for just \$39.00 by calling toll-free 1-800-333-4559. So call today. You'll get computer communication in its highest form. For a very down-to-earth price.

See your dealer today for PROCOMM PLUS 2.0. Current PROCOMM PLUS users: call 1-800-333-4559 now to upgrade.

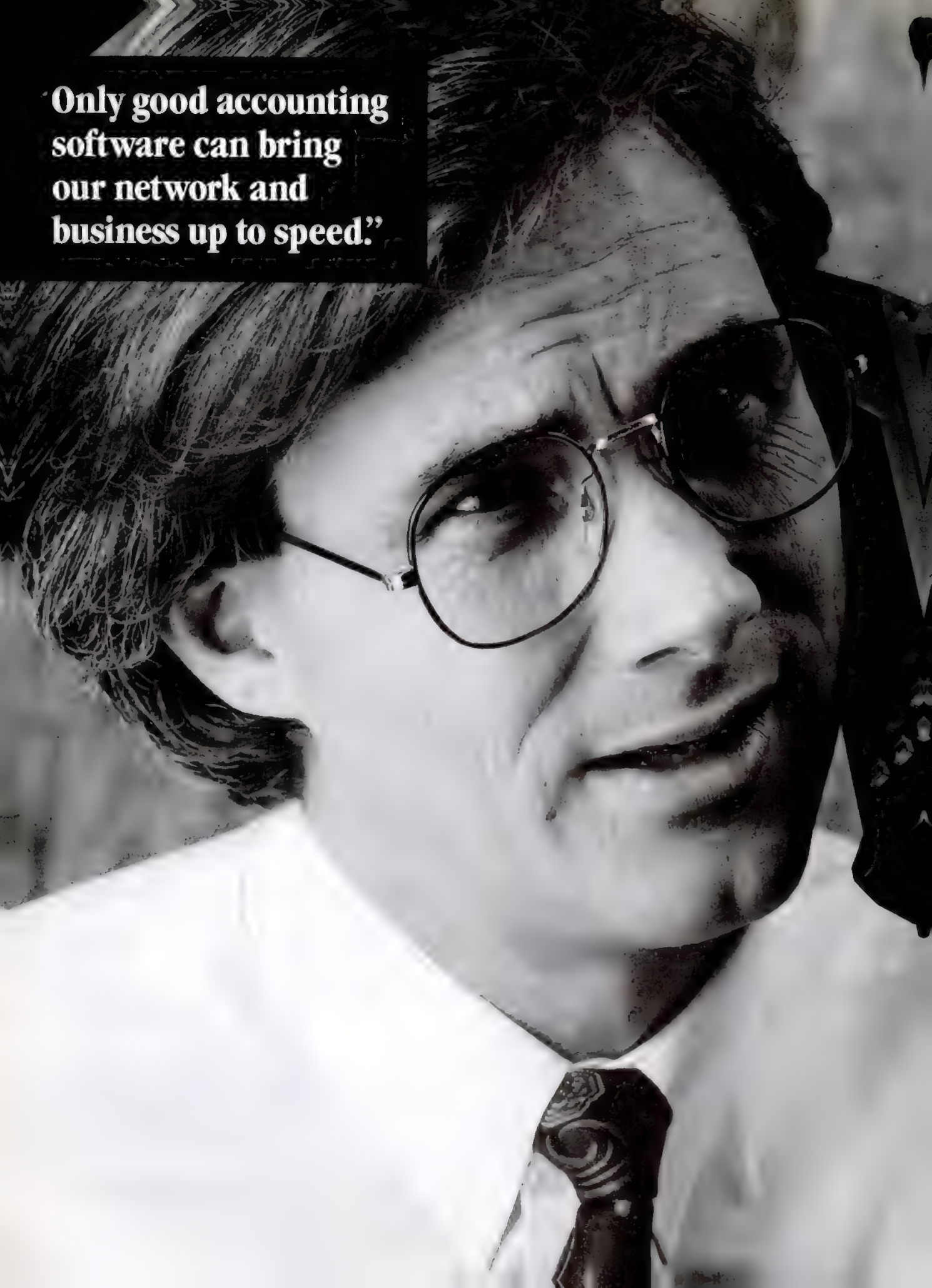
CIRCLE 504 ON READER SERVICE CARD



DATASTORM
DATASTORM TECHNOLOGIES, INC.

P.O. Box 1471 • Columbia, MO 65205 • 314.443.3282

**Only good accounting
software can bring
our network and
business up to speed."**



"That's the word from our accounting firm. Most of our PCs are already on a LAN, primarily for office automation. But our departments still aren't working together..."

"Look, you made the LAN investment to improve your office efficiency. Now expand it into a total information system you can profit from."

"Explain."

"You need a LAN accounting system that integrates sales, purchasing and production departments with your accounting department. Then, all your departments can communicate on the same wavelength. You get a teamwork approach that improves financial management, productivity and customer service."

"Any suggestions?"

"Macola. No other accounting software developer has more experience with LANs. Or a better record of performance. Only Macola has earned LAN Magazine's 'Product of the Year' award twice in a row."

"But our needs are unique?"

"Nobody offers more customization options...even vertical market solutions than Macola. Like fully integrated systems for distribution. For manufacturing. Plus retail and professional services."

"Is it hard to implement?"

"We did it in phases. Our Macola authorized consultant targeted our immediate needs, then provided training as we implemented each package. The transition was painless. And now, all our departments are working as a team...thanks to Macola on a LAN. I'd go into more detail, but it's seven o'clock."

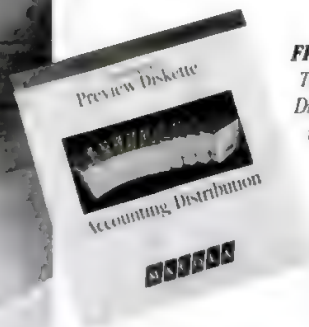
"So?"

"Doing a little 'networking' at the game tonight."

"Thanks a lot."

"Call Macola. They've got the answers you need."

1-800-468-0834 (USA) 1-800-336-8337 (CANADA)



FREE, if you call today!
The Interactive Preview
Diskette demonstrates the
many advantages and
unique vertical
market solutions of
Macola Software.



MACOLA[®]
SOFTWARE

333 East Center Street P.O. Box 485
Marion, Ohio 43301-0485
614/382-5999

**Accounting Software
You'll Never Outgrow.**

CIRCLE 263 ON READER SERVICE CARD

Choose from 17 integrated packages: **Accounting** — G/L, A/R, A/P, PR, A/D **Distribution** — I/M, COP, P/O, BOMP **Manufacturing** — MRP, M/S, SFC, L/P, SPC, SPR, CRP, J/C, plus Report Writer.

PC Magazine is a publication of Ziff Communications Co. LAN Magazine is a publication of Miller Freeman Publications. Macola is a registered trademark of Macola, Inc. Copyright 1990

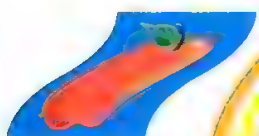
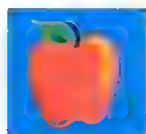
Now available
on CD-ROM!

COREL DRAW!

PC Graphics for Everyone!



SUPERSALE



It's
FAST
It's
FUN
It's
POWERFUL

Amazing special effects

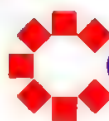
- envelope (warp) text and graphics
- simulate 3D with perspective function
- extrude to give depth to text/graphics
- blend between shapes and/or colors

Incredible type control

- over 150 fully scalable outline fonts
- see exact fonts on-screen
- paragraph and multi-column text
- import ASCII text files
- fit text to a curve
- create your own fonts or symbols

Superb value

- over 4000 symbols and clipart images
- dotted and dashed line styles
- over 80 arrowheads
- dozens of vector and bitmap patterns
- free Pantone* license
- 24 bit color supported
- 31 import/export filters
- CorelTRACE - batch autotrace utility
- MOSAIC - visual file manager
- WFNBOSS - typeface converter



COREL



Call customer service: (613) 728-8200 for information and a free demo disk

*Pantone, Inc.'s check-standard trademark for color reproduction and reproduction materials
Requires MS-WINDOWS 3.0

Tel: (613) 728-8200

Fax: (613) 761-9176

INT14, on the other hand, has become useful for sharing modems across LANs. LANs can provide PCs with the ability to share a pool of modems connected to another PC acting as a communications server. A communications server takes care of downloading information for you, leaving your PC free for other tasks and making it easy to access and share the information later.

There are several popular interfaces for network communications servers. IBM's specification, called the Asynchronous Communications Server Protocol Interface, makes use of NetBIOS's interrupt 5C services. Novell's ACS (Asynchronous Communications Server) product uses a standard variously called the NetWare Asynchronous Services Interface (NASI) or the Network Communications Services Interface (NCSI) built around Novell's IPX (Internetwork Protocol Exchange) standard. To use these servers, you must pick a communications program with support for the interface used on your network. Packages like DCA's *Crosstalk Mk. 4* and Hayes's *Smartcom Exec* support several types of network communications protocols.

Your own needs—whether you require a powerful scripting language, extensive terminal emulations, network support, or any of a host of other features—will determine which of the general-purpose communications programs reviewed here is best for you. Whether you're in the market for a low-cost shareware sleeper or you'd rather splurge for a more expensive commercial offering and the security it provides, one of these programs should meet your needs.

BLAST PC, Version 10.2.0

by Sara Parker

One communications package supports almost every platform. *BLAST PC*, by Communications Research Group, a subsidiary of modem manufacturer U.S. Robotics, comes in versions for a variety of operating systems including DOS, Unix, Xenix, VMS, and Macintosh. Any computer with *BLAST* can communicate with any other computer using a version of *BLAST*. For corporations that have implemented several different systems or aren't sure what the future holds in the way of hardware, *BLAST* provides a solution. You

COMMUNICATIONS ASYNCHRONOUS



BLAST PC, Version 10.2.0

Communications Research Group, 5615 Corporate Blvd., Baton Rouge, LA 70808; 800-242-5278, 504-923-0888.

List Price: \$250.

Requires: 300K RAM, DOS 2.0 or later (DOS 3.1 or later for background operation). Hard disk recommended.

In Short: *BLAST PC* is convenient for businesses with a variety of computer platforms. It includes background operation, an easy-to-learn script language, a powerful editor, and a good learning feature. But its speed is less than inspiring, it needs a special setup to take advantage of modems with data compression, and it prompts you for responses more than necessary.

CIRCLE 542 ON READER SERVICE CARD

can buy the DOS version we tested—*BLAST PC*, Version 10.2.0—for \$250.

BLAST can run in background mode, it offers a powerful built-in editor and mouse support, and it includes a good learning feature. However, it lacks support for 3270 terminal emulation. *BLAST* also relies rather heavily on user intervention in situations where automatic action would make communications faster and easier. The program constantly bombards you with prompts.

The DOS product ships with both 5.25- and 3.5-inch disks. During installation, you can set defaults from a self-explanatory setup screen. The Arrow keys take you to the different speeds, while the Spacebar cycles through the gamut of selections for each speed. You can adjust the packet size, set the data rate from 300 to 115,200 bits per second, select from a list of 26 modem setup strings, and choose any of eight COM ports.

WORKING FOR DATA COMPRESSION

It takes work to turn off *BLAST*'s autobauding feature. Autobaud matches the speed of the PC's COM port to the speed of the modem connection. If you're operating a modem with built-in data compression, like MNP 5 or V.42bis, the

modem can actually transfer more data to or from the phone line than the PC's serial port can handle. To reduce the bottleneck, it is often better to establish a faster connection between the PC and modem. With *BLAST*, you have to include special actions in the modem script to set up an RS-232 speed higher than the modem speed.

BLAST includes Kermit, XModem, YModem-G, and ZModem among its file-transfer protocols, as well as the proprietary *BLAST* (Blocked Asynchronous Transmission) protocol. When you use the *BLAST* protocol, you have to enter the packet size manually; this allows you to optimize the file for the quality of the circuit. Specifying a smaller packet size gives you closer control over the file transfer when line conditions are poor. *BLAST*'s proprietary windowed protocol is made for such noisy data links.

FILE-TRANSFER FLEXIBILITY

It's easy to transfer files in *BLAST*. With just a few quick steps, you can send and receive them. By appending the "a" option after a filename, you instruct the

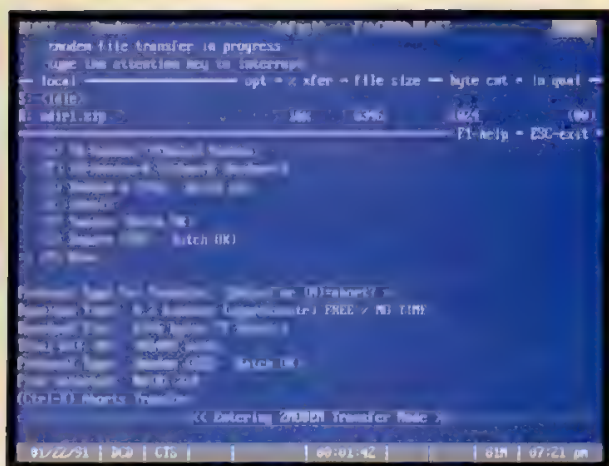
SUITABILITY TO TASK	
BLAST PC	
Mini and mainframe connections	☐ ☐ ☐ ☐ ☐
Automated information retrieval	☐ ☐ ☐ ☐ ☐
Systems and calls management	☐ ☐ ☐ ☐ ☐

program to append your file to an existing file on the remote system, which must also be running *BLAST*. The program helps you monitor file transfers by displaying a percentage indicating the amount of data that's been transferred, along with the number of bytes sent.

Among its 13 terminal emulation options are DEC VT52, VT100, VT220, and VT320, as well as HP 2392, IBM 3101, ANSI, and TTY. You can use *BLAST*'s keyboard-remapping feature to emulate a terminal keyboard or redesign the keyboard to your specifications.

Unfortunately, the Communications Research Group program does not support a file-transfer rate of 57.6 kilobits per second, and its throughput rate at the other settings on our Character-based ZModem tests was far from impressive. Using its own protocol helped the situation, but not enough when compared with some other products' speeds using their proprietary protocols.

COMMUNICATIONS ASYNCHRONOUS



During a file transfer, **BLAST PC** tells you on-screen how to abort the transfer. Since it's using the fast and dependable ZModem protocol, the program can take advantage of ZModem's ability to resume an interrupted transfer from the point where the abort occurred.

Like many of the communications products reviewed in this article, **BLAST** offers its own script language. The **BLASTscript** Programming Language is easy to learn and similar to BASIC. In only minutes you can grasp the programming logic and create and modify scripts. You can create scripts to dial remote systems automatically, set communications

parameters, transfer files, and exchange information with other programs. **BLAST** comes with a number of sample scripts to perform unattended file transfers, automatically log on to information services, and have **BLAST** act as a host to remote systems.

In case you need assistance with your communications software, Communica-

tions Research Group offers technical support weekdays from 8:00 A.M. to 6:00 P.M. through a toll number. With versions available for a wide variety of platforms, **BLAST PC** provides a solution for companies that want their disparate computers to communicate.

COM-AND, Version 2.7

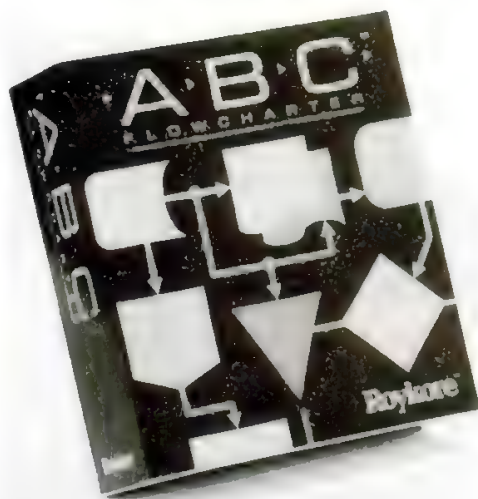
by Mike Byrd

Caber Software's **COM-AND** is a shareware package with many features found in its more expensive commercial competitors, but it does have limitations. In its favor are a sophisticated script language, support for a mouse, and a low \$35 registration fee. **COM-AND** also offers some welcome extras such as accessory programs for group chatting, for speech synthesis, and even for playing bridge and chess.

You can find **COM-AND** on many popular BBSs, such as Flashbacker in Alabama, and in library 3 of CompuServe's IBMCOM forum. It's generally available in a series of compressed files.

ABC Flowcharter for Windows

"Simply the easiest way to document procedures."



ABC Flowcharter™ makes drawing and editing flowcharts easier than ever. It's loaded with features that help you make and edit charts in a fraction of the time needed with other flowcharting or drawing programs.

ABC Flowcharter's advanced link feature lets you break complicated procedures into smaller, more manageable steps. Just click on a shape to display a sub-chart or procedure. It's that easy.

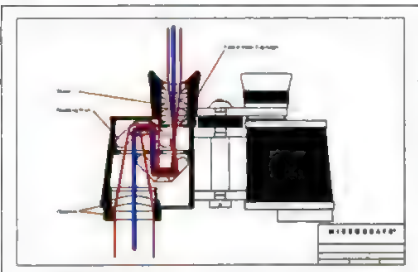
Ask your dealer for a demonstration or call **1-800-227-0847** for more information. See for yourself why **ABC Flowcharter** is quickly becoming the standard flowcharting tool for the Fortune 1000. Retail price \$295.

Roykore™

2215 Filbert St.
San Francisco, CA 94123
415-563-9175

Precision Illustration Just Got Better.

New!
Designer 3.1
Free Trial Offer



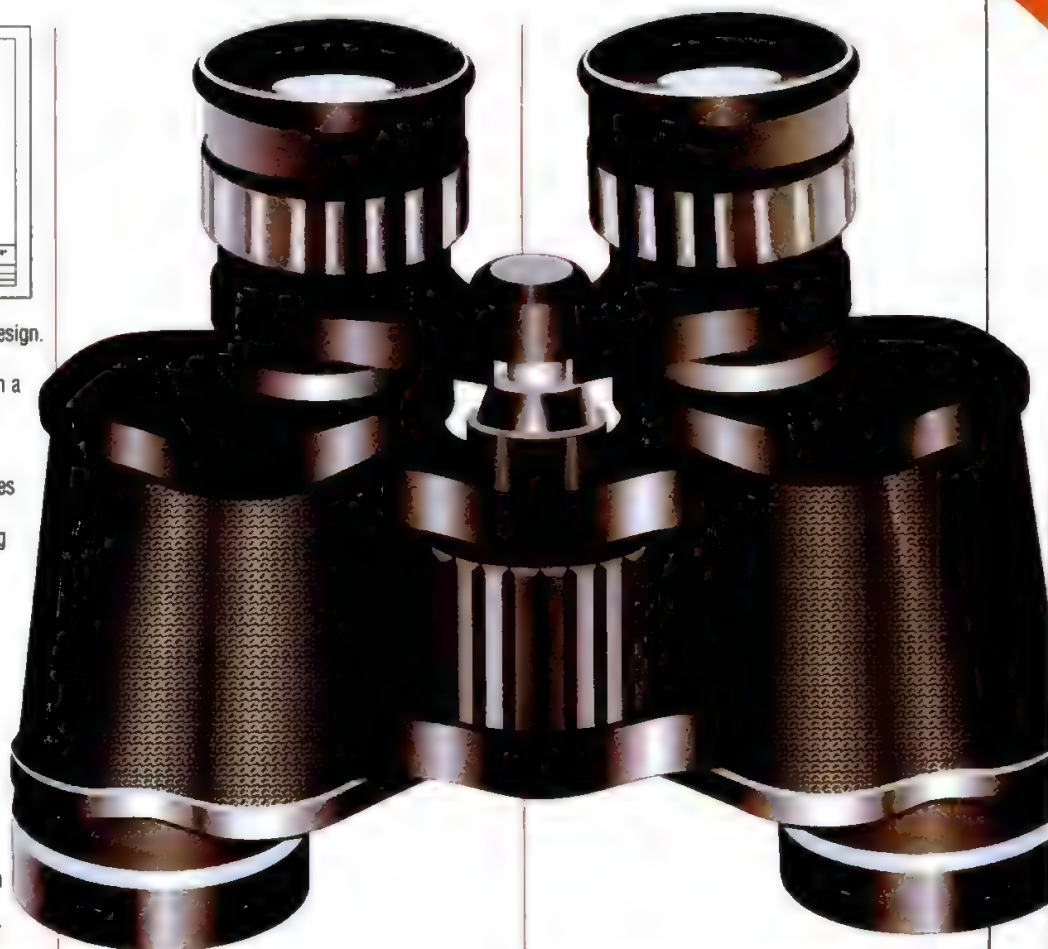
See The Difference. Technical illustration. Design.

Desktop publishing. Everything you can draw on a PC looks extraordinary with Designer™ 3.1.

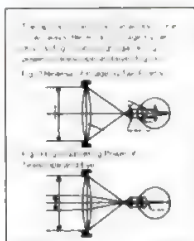
That's because no other illustration program gives you the power and precision to produce anything you can imagine.



Precision Illustration Defined. Unlike our competition, Designer 3.1 is the only illustration program that gives you *precision* control of your work environment. You will appreciate Designer's ability to produce complex images with features normally reserved for expensive CAD packages—all



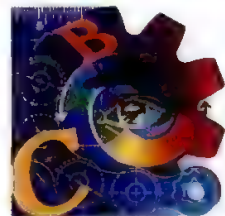
in a user-friendly
Microsoft®
Windows™ environment.
And new version 3.1 is
faster than ever!



See It for Yourself

—Free. Since there's no way we can begin to tell you everything Designer 3.1 is able to do, we'd rather show you. Just call **1-800-733-3729**, extension 5050, to receive a free working model.

Then you can experience the most sophisticated illustration program ever developed for the PC first hand. You'll see why Designer 3.1 is the *only* precision illustration program for Windows.



MICROGRAFX®
DESIGNER
The Drawing Board for Your Imagination.





ASYNCHRONOUS COMMUNICATIONS SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

Amount of disk space used Communications software enables a traveling user to connect with the home office when on the road. Knowing how much disk space a program requires to run can be helpful to users of some laptop machines, particularly those that don't include hard disks.

Network support Many organizations are installing asynchronous communications servers on networks so that people can share a pool of modems. Communications software that can use such pooled modems must be able to address specific interfaces such as **Interrupt 14h** (INT14), **NetBIOS**, or **Novell's NAPI**. You usually need only one type of network support for any single installation.

Number of comm ports on the menu In their standard configurations, PCs typically come with two serial ports; in practice, internal modems and I/O adapters with multiple asynchronous ports often occupy COM3 or COM4 locations. In some cases, they go beyond that, accommodating eight ports or more. Remember that even if the product's menu supports only four ports, it is possible to change the IRQ and memory address to redefine any of those four ports as COM5 or higher. The ability to control the speed of ports using the RS-232C data terminal equipment (DTE) line is important for orderly transmission.

Hayes ESP support The Hayes ESP board includes two serial ports for simultaneously sending and receiving data. The board's features—including an Intel 8031 coprocessor, 1K of buffer memory, and Hayes' Enhanced Serial Interface (ESI)—allow incoming data to be sent directly to a PC's memory, taking the processing burden off the computer's CPU and increasing allowable throughput.

Number of predefined setup strings A modem setup string contains the information needed to initialize a specific make and model of modem. Some setup strings can initialize several types of modems, but generally the more setup strings available in a product, the better its ability to work in many different installations.

User-definable setup strings The ability to produce and save user-defined modem setup strings lets you use a modem that may not be specifically listed in the program's list of predefined setup strings.

Protocols on menu **IND\$FILE** is a text-editing program with some file-transfer capabilities that runs on IBM mainframe computers.

Special flavors of the *Kermit* and *XModem* protocols (**sliding windows** and **ACK ahead**, respectively) include the ability to accept late acknowledgements in a sliding window of time; this is particularly useful for communications systems such as a satellite link with a long delay.

Proprietary protocols are included with some programs. These are generally unique to the program, but companies like Hilgraeve make their proprietary protocols available to other programs as external protocols.

User-installed external protocols refers to a program's ability to read in program modules containing code for specific file-transfer protocols.

A scripting language provides a program with the ability to automate functions. Languages with a large **number of verbs** (or commands) are generally more powerful and flexible than those with fewer verbs. An **auto-learn function** allows a program to monitor an on-line exchange of data and create a script to automate the functions of the calling device. The ability to control **synchronous communications** exchanges (like those used with X.25 networks and mainframe connections) through the programming language is often important to people in organizations with sophisticated communications needs.

Canned communications scripts make it easier for users to configure their software and hardware for services such as **MC! Mail** and **CompuServe**. Products like *Telnet* and *Smartcom Exec* do not come with these scripts built-in. Yet you can easily download scripts for *Telnet* from the bulletin board where you obtained the communications program;

	QModem	COM-AND	Telnet	Unicom	PereLine	Crosstalk Communicator	ProComm Plus
List price	\$30.00 (registration fee)	\$35.00 (registration fee)	\$39.00 (registration fee)	\$45.00 (registration fee)	\$49.95	\$99.00	\$119.00
OPERATING ENVIRONMENT							
DOS	☒	☒	☒	☐	☒	☒	☒
Microsoft Windows 3.0	☐	☐	☐	☒	☐	☐	☐
Other	None	None	None	None	None	None	None
MEMORY/DISK USAGE							
Uses expanded memory	☒	☒	☒	☐	☒	☐	☐
Uses extended memory	☐	☒	☐	☐	☐	☐	☐
Amount of disk space used	1.1MB	1.2MB	350K	352K	792K	643K	900K
NETWORK SUPPORT							
Interrupt 14h	☐	☒	☐	☐	☐	☐	☐
NetBIOS	☐	☒	☐	☐	☐	☐	☐
Novell's NAPI	☐	☐	☐	☐	☐	☐	☐
HARDWARE							
Number of comm ports on the menu	8	4	8	4	16	4	8
Maximum serial port speed (bps)	115,200	115,200	115,200	19,200	115,200	115,200	115,200
Hayes ESP support	☐	☐	☐	☐	☐	☒ (serial mode)	☐
Mouse support	☐	☒	☐	☒	☒	☐	☒

☒—Editors' Choice ☒—Yes ☐—No

likewise, you can download scripts for *Smartcom Exec* from the Hayes BBS.

Terminal emulation modes on menu The ability to emulate many terminals—ANSI, CompuServe Vindex, DEC VT220, IBM 3101, and TTY are among the most important—can be useful to people in a multivendor computing environment.

The popularity of DEC minicomputers makes the ability to emulate **DEC VT220** terminals particularly important to many users. If the product supports special printing modes such as **transparent terminal printing** and **auto-print** (which are methods of printing from the DEC host to a terminal or PC emulating a terminal), it probably has a reasonably complete emulator.

The **TTY** mode is commonly called a "glass Teletype" because it prints characters on the screen without special formatting, much like an old Teletype machine.

Host operations Many programs can operate as a host for callers, with capabilities that include **mini-BBS features** (simple electronic bulletin board functions) and full **remote access** to run applications. Various security levels, including a **sysop level** (special rights for the system operator), add data protection.

The **phone directory** provides a list of the

services available for calling and makes for fast selection.

Callback feature refers to the program's ability to call a number again if it was busy the first time.

Password security for local use This feature lets the program prevent other people from gaining access to the keyboard and using on-line services.

A **scroll-back buffer** allows you to review the exchange of data over the communications line without interrupting the on-line session. The amount of data available for review depends on the size of the buffer, which is usually adjustable from within the program.

Can transmit blocks from buffer If you can transmit data from within the scroll-back buffer, you can repeat detailed commands or addresses and quote back lines of text without using an external program.

Built-in text editor Many of these programs not only allow you to use your own text editor, but they include their own built-in text editor. Important functions for a program's text editor to include are the ability to **search**, perform a **search-and-replace**, and **edit multiple files** simultaneously. Programs that **let you see the message you are answering** add a particularly welcome touch.

File management Some programs include file management capabilities that allow you to manipulate the files on a local or networked drive without leaving the program. Some even offer a **DOS shell** to let you control files from within the program.

Some of the *Windows*-based programs do not include additional features like text editors or file management capabilities. Note that even when the program lacks these features, the *Windows* environment can provide them.

Flow control You must select a flow control parameter to let the modem and computer know when to send more data to fill the modem's buffer. The flow control is necessary to make sure that data is not lost due to data overrun. When the modem's buffer gets close to full, it needs to warn the computer.

The *hardware flow control* method uses two wires, RTS/CTS (Request to Send/Clear to Send), which the modem and the PC can alternately raise and lower to tell each other when they are ready to send and receive data. *Software flow control* sends these signals using two data characters, XON/XOFF, but this takes more time, and the software needs to distinguish XON/XOFF from the other data. RTS/CTS is the more popular flow control setting, although you must ensure that your serial cabling supports it.

All of the programs we reviewed offer both hardware and software flow control, which is why this information does not appear in the table.

	 Smartcom Exec	Professional YAM	Mirror III	WinComm	Crosstalk for Windows	HyperAccess/5	 Crosstalk Mk. 4	BLAST PC	 DynaComm Asynchronous Edition
MTEZ									
\$129.00	\$129.00	\$139.00	\$149.00	\$149.00	\$195.00	\$199.00	\$245.00	\$250.00	\$295.00
									
None	None	None	None	None	None	OS/2	None	None	HP NewWave Environment
									
950K	1MB	256K	1.4MB	640K	500K	620K	1.2MB	1MB	1.8MB
									
									
									
4	8	8	4	4	4	4	8	8	4
38,400	115,200	115,200	115,200	115,200	19,200	115,200	115,200	115,200	19,200
									
									

CONTINUES

THIS IS THE SHOULD'VE HAD IN

You've been struggling with MS-DOS from the day you bought your PC.

Well, those days are gone.

Because now there's something better. Namely, DR DOS™ 5.0 from Digital Research.

DR DOS 5.0 is more than just

personal computer works.

Take MemoryMAX™, for instance, our memory management feature. It frees up as much as 620K for your application.

There's support for large hard disk partitions,

so you don't have to carve up

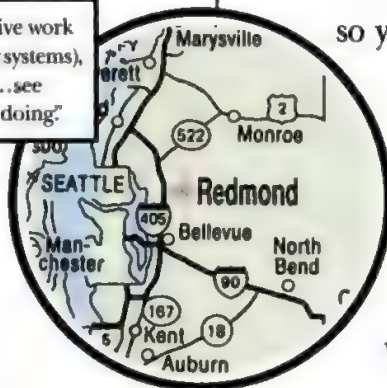
your disk into little pieces and then waste time looking for your files.

Plus a graphical

interface, a full-screen text

a fully-compatible DOS. It's full of advanced features and capabilities that actually improve the way your

"There's very innovative work going on (in operating systems), Digital Research...see what those guys are doing."



We'd really love to tell you who said this, but we can't. We will say this, though. He really knows what he's talking about.

DR DOS 5.0
Operating System for Personal Computers

Unlocks the power of your PC with the most advanced, powerful, and feature-rich DOS.

TOSS YOUR DOS, \$79.

Now for a limited time, you can get DR DOS 5.0 for just \$79. What's more, you'll also get a coupon entitling you to a copy of Lotus Magellan for just \$19.95 (shipping & handling), regularly a \$139 value.



editor, and on-line help.

And DR DOS 5.0 makes just about everything run better, from networks to spreadsheets to desktop publishing programs. It works with everything

DOS YOUR PC THE FIRST PLACE.

written for MS-DOS, and even improves the performance of Windows. Did we mention it practically installs itself?

You'll also be glad to know we're not the only ones who like it. *Byte* magazine presented us with their 1990 "Award of Distinction." And *PC Magazine* honored DR DOS 5.0 as a

finalist in their 1990 Technical Excellence Awards, and called it, "a technological breath of fresh air." And hundreds of original equipment manufacturers and

value-added resellers have already added DR DOS 5.0 to their systems, with more joining us everyday.

So why not toss your DOS? And get DR DOS 5.0 instead.

It's the DOS your PC should have had in the first place.

STANDARD? WHAT STANDARD?

At last count, there were umpteen versions of MS-DOS. Many are less than wonderful, and some don't even work with all MS-DOS applications. DR DOS 5.0, however, works beautifully. And isn't that the mark of a real standard?



Look for it where you buy software, or call us at 1-800-274-4DRI for the reseller nearest you.

NOW YOU DON'T HAVE TO STOCK UP ON UTILITIES.



PAY \$350 FOR ALL THESE.



OR JUST BUY THIS FOR \$79.

You'd have to buy over \$350 worth of utilities to get what's already included in DR DOS 5.0. There's simply never been a more powerful, feature-rich DOS.



Digital Research.

WE MAKE COMPUTERS WORK BETTER.

COMMUNICATIONS

ASYNCHRONOUS



ASYNCHRONOUS COMMUNICATIONS SOFTWARE: SUMMARY OF FEATURES

	QModem	COM-AND	Telix	Unicom	PereLine	Crosstalk Communicator	ProComm Plus
MODEM SETUP STRINGS							
Number of predefined setup strings	71	6	None	None	42	40	104
User-definable setup strings	■	■	□	■	■	■	■
FILE-TRANSFER PROTOCOLS							
Protocols on menu:							
CompuServe B	□	■	■	■	□	■	■
CompuServe B Plus	□	■	□	□	□	■	■
CompuServe Quick B	□	■	■	■	□	■	■
IND\$FILE	□	□	□	□	□	□	□
Kermit	□	■	■	■	■	■	■
Kermit with sliding windows	□	■	■	□	■	■	■
Sealink	□	□	■	□	□	□	■
XModem	■	■	■	■	■	■	■
XModem 1K	■	■	■	■	■	■	■
XModem ACK ahead	□	■	■	□	■	■	■
YModem batch	■	■	■	■	■	■	■
YModem-G	■	■	■	■	■	■	■
Proprietary protocols	None	None	None	None	None	None	None
User-installed external protocols	■	■	■	■	■	■	■
SCRIPTING LANGUAGE							
Number of verbs	56	175	150	37	188	18	208
Auto-learn function	■	■	□	□	■	■	■
Synchronous communications	□	■	■	□	□	□	□
CANNED COMMUNICATION SCRIPTS							
MCI Mail	□	□	□	□	□	■	□
CompuServe	□	■	□	■	■	■	■
Dow Jones News/Retrieval	□	□	□	□	■	■	■
OAG	□	□	□	□	■	■	□
PC MagNet	□	□	□	□	□	□	□
TERMINAL EMULATION MODES ON MENU							
ANSI	■	■	■	■	■	■	■
CompuServe Vidtex	□	■	□	□	■	□	□
DEC VT220	□	□	□	□	■	■	■
Double-height, double-width characters	N/A	N/A	N/A	N/A	□	□	□
132-column mode	N/A	N/A	N/A	N/A	■	■	■
Horizontal scrolling	N/A	N/A	N/A	N/A	■	■	■
Transparent terminal printing	N/A	N/A	N/A	N/A	■	■	■
Auto-print	N/A	N/A	N/A	N/A	■	■	■
IBM 3101	□	□	□	□	■	■	■
TTY	■	■	■	■	■	■	■
HOST OPERATIONS							
Mini-BBS features	■	■	□	■	■	■	■
Remote access							
Unlimited host privileges	■	■	■	■	■	□	■
Restricted host privileges	■	■	■	□	■	■	■
Remote call-in security	■	■	■	■	■	■	■
Sysop level	■	■	■	□	■	■	■
Mail	■	■	□	□	■	□	■
Public messages	■	■	□	■	■	■	■

□—Editors' Choice ■—Yes □—No

N/A—Not applicable: The product does not have this feature.

COMMUNICATIONS ASYNCHRONOUS

MTEZ	 Smartcom Exec	Professional YAM	Mirror III	WinComm	Crosstalk for Windows	HyperAccess/5	 Crosstalk Mk. 4	BLAST PC	 DynaComm Asynchronous Edition
51	None*	41	50	22	34	107	40	26	4
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
☒	☐	☒	☒	☒	☒	☒	☒	☐	☒
☒	☐	☒	☒	☒	☒	☒	☐	☐	☒
☐	☒	☐	☐	☐	☐	☐	☒	☐	☐
☒	☒	☒	☒	☒	☒	☒	☒	☒	☐
☐	☐	☒	☒	☐	☐	☐	☒	☐	☐
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
☐	☒	☒	☐	☐	☐	☐	☒	☒	☐
☒	☒	☒	☒	☒	☒	☐	☒	☒	☒
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
None	None	None	None	None	CrossTalk, Dart	HyperProtocol	CrossTalk, Dart	BLAST	None
☐	☒	☒	☒	☐	☐	☒	☒	☐	☐
99	191	More than 100	200	202	More than 200	155	347	65	300
☐	☒	☒	☒	☒	☒	☒	☒	☒	☒
☐	☐	☐	☐	☐	☐	☐	☒	☐	☒
☒	☐	☐	☒	☐	☒	☐	☒	☒	☒
☒	☐	☐	☒	☒	☒	☐	☒	☒	☒
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
☒	☐	☐	☐	☒	☐	☒	☐	☐	☒
N/A	N/A	☐	☐	N/A	N/A	☒	☐	☒	☒
N/A	N/A	☒	☐	N/A	N/A	☒	☒	☒	☒
N/A	N/A	☐	☐	N/A	N/A	☒	☒	☒	☒
N/A	N/A	☐	☒	N/A	N/A	☒	☒	☒	☒
☒	☐	☒	☒	☐	☒	☒	☒	☒	☒
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
☒	☒	☒	☒	☒	☒	☒	☒	☐	☐
☒	☒	☒	☒	☒	☐	☒	☐	☒	☒
☒	☒	☒	☒	☒	☒	☒	☒	☒	☐
☐	☒	☒	☐	☐	☐	☒	☒	☐	☐
☐	☐	☒	☒	☐	☐	☒	☒	☐	☐
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

* Smartcom Exec does not use setup strings but automatically recognizes the modem type.

CONTINUES

Ironically, the difference bet and the second best ha



Yes, the ColorPoint offers top-notch color. It also offers superior performance in other respects. But the best news of all is the price—\$6,999 for the A (letter) size and \$9,999 for the B (tabloid) size.



ColorPoint is PANTONE® certified. So it simulates PANTONE colors and greatly simplifies color proofing.

ColorPoint's unique roll-feed, double-cut technology gives you the biggest image size of any comparable printer. Delivered on perfectly trimmed and finished pages. And this same technology also assures you perfect registration every time.

ween the best color printer s little to do with color.

ColorPoint is 100% Adobe PostScript language compatible, thanks to the PhoenixPage interpreter



From graphics to fonts, what you get out of the printer is faithful to what you sent it. What's more, PhoenixPage's advanced screening techniques produce smoother shading and less grainy images. ColorPoint also supports industry standard downloadable typefaces such as Adobe Type 1 fonts—including hints



Obviously, color is critical. It's why you're looking at color printers in the first place. So rest assured, ColorPoint PS offers the best color around.

But before you decide on a color printer purely on the basis of color, you should take a look at ColorPoint's other advantages as well. The speed. The PostScript compatibility. The perfect registration. The ability to print a full page, both in A and B sizes—even in transparency form.

Then take a look at the price.



Five communication ports—parallel, serial, AppleTalk and two SCSI ports—make it easy to connect ColorPoint to Mac, PC, workstation or larger computers. And ColorPoint is easy to share because it will automatically poll the ports, so you don't have to tell it what interface you're using.

ColorPoint includes an Intel® 80960 embedded RISC-based processor that speeds up image-processing time. So you not only get superior 300 dpi quality, you get it as much as 60% faster.



We think you'll find that deciding between ColorPoint and second best is a black and white decision.

To find out more, give us a call at 1-800-873-4561 and ask for department SI-91.

SII ●
Seiko Instruments



FACT FILE

COM-AND, Version 2.7

Caber Software, distributed by SupportWare, P.O. Box 14927, Long Beach, CA 90803-1449; 213-439-6104.

List Price: \$35 registration fee.

Requires: 252K RAM, DOS 2.0 or later.

In Short: *COM-AND*, a shareware general-purpose communications program, uses a strong script language to provide much of the versatility you would expect of a commercial product. Its biggest drawback is that with RTS/CTS flow control enabled, it could not transfer files at any speed during our testing.

CIRCLE 543 ON READER SERVICE CARD

COMMUNICATIONS

ASYNCHRONOUS

The version we tested, Version 2.7, totals about 753K among the four files CA27-1.ARC through CA27-4.ARC.

COM-AND senses a first-time execution and asks a few hardware configuration questions when you install it. One weak link is that you can choose only a limited number of modem types from built-in scripts containing initialization strings: Microcom 9624c, Everex 2400 internal, Leading Edge 2400B half-size internal, Practical Peripherals 2400 half-size internal, Everex Evercom 24 Plus (MNP), and Hayes-compatible. This last one has wide application, but the generic approach is not as effective as the lists of specific modems that other companies

offer. You can create specific modem setup strings later.

In addition to ZModem, built-in file-transfer protocols include CompuServe B, CompuServe Quick-B, Kermit, XModem (checksum and CRC), XModem 1K, and YModem-G. *COM-AND* can also shell out to DOS to run external protocols. The program requires 252K RAM, so you should have adequate memory available. You can set the program to a maximum port rate of 115,200 bits per second.

You can run *COM-AND* from its pull-down menu system or through its function-key and Alt-letter-key sequences. Help is not context-sensitive, but you can call up a full-screen help display at any time during your *COM-AND* session by pressing F10.



ASYNCHRONOUS COMMUNICATIONS SOFTWARE: SUMMARY OF FEATURES

	QModem	COM-AND	Telix	Unicom	PereLine	Crosstalk Communicator	ProComm Plus
GENERAL FEATURES							
Phone directory	■	■	■	■	■	■	■
Callback feature	■	■	□	□	■	□	□
Logs calls	■	■	■	■	■	■	■
Password security for local use	□	■	□	□	■	■	□
Keyboard macros	■	■	■	■	■	■	■
Background operation (sending and receiving files)	□	■	□	■	■	□	□
Context-sensitive help screens	■	□	□	□	■	■	■
Scroll-back buffer	■	■	■	■	■	■	■
Can transmit blocks from buffer	□	□	□	□	□	□	□
Screen capture to disk	■	■	■	■	■	■	■
TEXT EDITOR							
Built-in text editor	□	□	■	□	■	■	■
Search	N/A	N/A	■	N/A	■	■	■
Search-and-replace	N/A	N/A	□	N/A	■	■	■
Edit multiple files	N/A	N/A	□	N/A	■	□	■
Maximum number of edit windows	N/A	N/A	1	N/A	1	1	2
Copy/move/delete block	N/A	N/A	□	N/A	■	■	■
Print capabilities	N/A	N/A	□	N/A	■	■	□
Lets you see message you are answering	N/A	N/A	□	N/A	□	□	□
User can incorporate outside editor	■	■	■	■	■	□	■
FILE MANAGEMENT							
Copy	■	■	■	□	■	■	□
Delete	■	■	■	□	■	■	□
Move	■	■	■	□	■	■	□
Compress	□	■	□	□	□	□	□
DOS shell	■	■	■	□	■	□	■
TECHNICAL SUPPORT							
Free support (A.M.-P.M. except as indicated)	8:00-5:00 M-F (C.S.T.)	10:00-10:00 every day (P.S.T.)	9:30-5:00 M-F (E.S.T.)	6:00 P.M.-9:30 P.M. M-Th (P.S.T.)	8:00-5:00 M-F (P.S.T.)	8:30-8:00 M-F (E.S.T.)	9:00-5:00 M-F (C.S.T.)
Toll-free line	□	■	□	□	■	□	□
BBS	■	■	■	□	■	■	■

■—Editors' Choice ■—Yes □—No

N/A—Not applicable: The product does not have this feature.

COMMUNICATIONS ASYNCHRONOUS

POWERFUL SCRIPTING

COM-AND supports RLE (run length encoded) graphics. The program comes with built-in ANSI, CompuServe Vidtex, DEC VT52 and VT100, and TTY terminal emulation modes. The keyboard-remapping function lets you redefine your keystrokes to emulate a terminal keyboard.

The program's power flows in large part from its scripting language. It comes with scripts for controlling a wide array of functions. You can make **COM-AND** act as a dial-in host or a full Kermit server. It can offer a file manager shell or enable PC-to-PC transfers. Scripts are available to make the program learn your keystrokes, load external protocols, chain-dial a series of numbers, run an on-line game, or

perform a screen dump to a connected printer. One script sets your PC's system time by calling the Naval Observatory, while another sets an alarm time. The

**One COM-AND
script sets your
system's time by
calling the Naval
Observatory.**



script language also makes mouse functions available.

COM-AND generally works well; in our experience, its CompuServe script for automated log-ons worked flawlessly. The learning script, however, is not perfect. When you run it, it should record your keystrokes and build another script from your actions. But after we tried to make the program learn how to access a local BBS, for example, the reconnect attempt was unsuccessful. The manual points out that you may have to edit a script after compiling it with the learning script.

COM-AND also includes a script to enable the speech synthesis program. This program uses a speech driver that translates text to phonemes, which your PC's speaker then reproduces in sounds. It won't

MTEZ	 Smartcom Exec	Professional YAM	Mirror III	WinComm	Crosstalk for Windows	HyperAccess/5	 Crosstalk Mk. 4	BLAST PC	 DynaComm Asynchronous Edition
N/A									
9:00-4:30 M-F (C.S.T.)	8:00-6:00 M-F (E.S.T.)	1:30 P.M.- 5:00 P.M. M-F (P.S.T.)	9:00-6:00 M-F (E.S.T.)	8:00-5:00 M-F (C.S.T.)	8:30-8:00 M-F (E.S.T.)	8:00-6:00 M-F (E.S.T.)	8:30-8:00 M-F (E.S.T.)	8:00-6:00 M-F (C.S.T.)	8:00-6:00 M-F (C.S.T.)

SUITABILITY TO TASK				
COM-AND				
Mini and mainframe connections	☒	☒	☐	☐
Automated information retrieval	☒	☒	☐	☐
Systems and calls management	☒	☒	☐	☐

prove useful to many people, though, as it works only on 4.77-MHz PCs; anything faster makes the speech sound like Minnie Mouse.

FLOW CONTROL PROBLEMS

In our performance tests, *COM-AND* had a significant problem handling a file transfer when hardware RTS/CTS (Request to Send/Clear to Send) flow control was implemented; the program failed at the three port speeds used during testing. With RTS/CTS turned off, it was one of the fastest file-transfer programs. Nevertheless, the ability to use RTS/CTS flow control is necessary to make the most efficient connections to high-speed modems; *COM-AND*'s inability to handle this is a significant limitation.

If you don't wish to download *COM-AND*, SupportWare distributes the program on floppy disks for Caber Software. You can order the current version by sending \$5 for three 5.25-inch or \$10 for two 3.5-inch disks. If you decide to use the program, you pay the \$35 registration fee and get free technical support from SupportWare, 10:00 A.M. to 10:00 P.M. (P.S.T.) seven days a week.

COM-AND is a communications package with strong script facilities (although you may have to edit those built from a learn script) along with an attractive price.

COMMUNICATIONS ASYNCHRONOUS

Its biggest limitation—the one that may keep some users away—is its inability to use RTS/CTS flow control.

Crosstalk Communicator, Version 2.0

by Sara Parker

Digital Communications Associates, a strong force in the communications software market, makes a package that's easier to install and use than its big-gun predecessors. The \$99 *Crosstalk Communicator* lacks the functionality of higher-end products like DCA's own *Crosstalk Mk. 4* and Hilgraeve's *HyperAccess/5*, but for the price, it's hard to beat. And if you have users in the corporate environment already working with scripts developed with *Mk. 4*'s CASL (Crosstalk Application Script Language), you can use the same scripts with *Communicator*.

Communicator installs in well under 5 minutes. The program lists 40 modem set-up strings on the installation menu, making the package easy to configure for your setup. *Communicator*'s documentation includes a quick-start guide for experienced users as well as a chapter for the inexperienced.

PRECONFIGURED DIALING ENTRIES

The dialing directory is the first screen you will see after booting up *Communicator*. The directory comes with ten preconfigured entries, including CompuServe

SUITABILITY TO TASK				
Crosstalk Communicator				
Mini and mainframe connections	☒	☒	☐	☐
Automated information retrieval	☒	☒	☐	☐
Systems and calls management	☒	☒	☐	☐

and Dow Jones News/Retrieval. You can also choose to set up your own phone numbers. *Communicator* prompts you for information about terminal type and the protocol you wish to use and lets you immediately place the call.

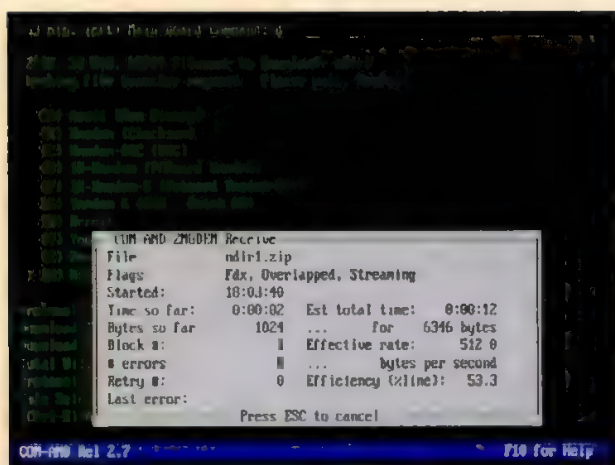
You can modify any of the dialing directory entries at any time. To help automate the process, you can specify a set of default settings for the directory to use for every entry you add; this includes defaults for the COM port, bit-per-second rate, word format, protocol, and other factors. If you're not sure how to proceed, simply select Alt-H to consult the context-sensitive on-line help screens.

Communicator makes many on-line operations simple. Selecting Alt-A from the dialing directory menu gives you a list of functions. You can pop up the built-in editor, send a break signal after making a connection, load a filter to examine or change the data you receive, and start learn mode to record your keystrokes and create scripts. *Communicator*'s own scripting language is limited to 18 verbs, though. The file-transfer protocol choice calls up a menu that lists, among others, CompuServe B, Kermit, XModem, XModem 1K, YModem batch, YModem-G, and ZModem. During the transfer, *Communicator* gives you a read-out of the portion of the file that has been sent or received.

Communicator supplies a range of terminal emulation types to choose from. While not as extensive as some other products' selection, it does contain the more popular emulation types, including DEC VT52, VT100, VT102, VT220, and VT320, as well as ANSI, TTY, and IBM 3101. You can set the speed at up to 115,200 bits per second.

SEARCHABLE BUFFER

Like most communications packages, *Communicator* lets you capture incoming information to disk or print the data as it receives it. The review buffer, used to store information that exceeds the screen capacity, holds up to 48K of data. You can view the information line by line or screen



The shareware program *COM-AND* displays a useful pop-up window during a file download telling you exactly how much of the file it has received and the total time it expects to take.

**“THE MOST
POWERFUL
COMPUTERS
ARE THE
ONES PEOPLE
ACTUALLY
USE.”**

—Apple Computer

First off, let's get one thing straight. We totally agree with Apple.* A truly powerful computer is measured in how often it's used.

IF YOU LISTEN TO APPLE, THIS IS THE MOST POWERFUL COMPUTER IN THE WORLD.

But while Apple has taken great strides in making the personal computer more useful, we've gone substantially farther.

Introducing the T2000SX notebook computer.

Quite simply, the T2000 SX is a more useful personal computer because it allows you to work how you want to work. When you want to work. And where you want to work.

Painstakingly engineered with you clearly in mind, the T2000SX will help you work more efficiently than ever before.

Virtually every feature you can find on a desktop computer, you will



Our technologically superior battery can be fully recharged in a mere ninety minutes. find on the T2000SX: An 80386™SX processor with a math coprocessor socket, VGA compatible display, 1 MB (expandable to 9MB) of 70 nsec RAM, a 40 MB hard disk with 19 msec access time and 1.5 MB/sec data transfer rate.



The T2000SX has a 40MB hard disk with 19 msec access time.

But more important than the specs themselves, is the way the T2000SX lets you

use them. Which is more often.

Our fluorescent side-lit screen provides even distribution of light. (Actual size.)

Welcome to the next generation in personal computing.

Because the T2000SX can fit easily into a briefcase (it weighs a scant 6.9 pounds), you can take it anywhere you go and use it in more ways than you can imagine.

Need to make revisions to a



Our internal AutoResume back up battery automatically saves your work if your main battery runs out.

business proposal? The T2000SX gives you the freedom to do it from a train. The client wants an estimate on costs? You can give it to him right then and there— wherever there is.

No more wasting time running

back to the office. Because the office is always with you.

But just in case there's something



Our user-installed memory card allows you to add up to 8 MB of memory yourself.

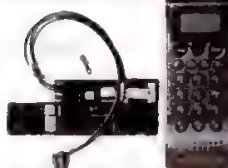
back at the office you still need, you can get back to it with our optional built-in modem. Which supports industry standard error correction and data compression (CCITT V.42, V.42bis, MNP® 5 and 10). It even supports cellular data communications via our optional smart cable adapter.

The T2000SX also has a unique feature you won't find on any other computer in the world. It is called AutoResume.

AutoResume: Think of it as a bookmark for your computer.

AutoResume automatically saves whatever you're working on whenever you turn the computer off. And it lets you go directly to the program you were using last when you're ready to start up again. So you don't have to reboot, restart your application and reload your files.

AutoResume



The T2000SX has an optional modem that allows data communications via a cellular phone.

also helps save on battery life and it allows you to change batteries without losing an ounce of information.

As for batteries, the T2000SX touts the latest in battery technology—Nickel Hydride. Nickel Hydride delivers 22% more watt-hours per pound than NiCad and it doesn't suffer from memory effect.

In keeping with the Toshiba tradition, the T2000SX also offers superior ergonomics. Like full-size, standard-spaced keys on a keyboard which has a full set of 12 dedicated function and 8 cursor control keys. And a VGA compatible, reversible black on white or white on black high resolution display.

Okay, let's wrap this thing up.

These are just a few of the reasons why we believe the T2000SX is the most useful, and therefore, most powerful computer in the world. And why PC Week Labs said, "the T2000SX offers performance comparable to the LTE 386s/20, plus many of the design features that have made Toshiba a market leader in portable PCs."

PC WEEK

If you'd like to learn more about the T2000SX or any of our other portable computers, call us at 1-800-457-7777.

In closing, we'd like to thank you for reading our ad.

We'd also like to thank our friends at Apple for giving us such a wonderful endorsement.

TOSHIBA

In Touch with Tomorrow.

CIRCLE 379 ON READER SERVICE CARD



The T2000SX comes complete with Hypertext on-line documentation.

COMMUNICATIONS ASYNCHRONOUS



Crosstalk Communicator, Version 2.0
Digital Communications Associates Inc., 1000
Alderman Dr., Alpharetta, GA 30202-4199;
800-241-4762, 404-442-4000.

List Price: \$99.

Requires: 320K RAM, DOS 2.0 or later.

In Short: *Crosstalk Communicator* offers a low-cost easy-to-use communications package, especially for one-to-one communications. It includes a searchable buffer and well-written documentation for both basic and advanced levels.

CIRCLE 544 ON READER SERVICE CARD

more², DCA's remote computing package, for \$99.

DCA developed *Communicator* to fill a missing link in its line of communications products. Targeted at people who want an easy-to-use communications package, *Communicator* takes advantage of numerous built-in protocols and of scripts written with *Crosstalk Mk. 4*'s powerful CASL. *Communicator* is not as feature-laden as *Mk. 4*, but it is not as costly either.

Crosstalk for Windows, Version 1.1

by Sara Parker

If you're a *Windows* fan shopping for a communications package, *Crosstalk for Windows* is a sure bet. It offers scrollable window displays, the ability to capture session information and replay it from a script, and, of course, background file transfers. *Crosstalk for Windows* also provides the auto-start version of the ZModem protocol (this ensures that the requesting program is automatically serviced by the program receiving the request). For \$195, DCA gives *Windows* users an easy way to communicate.

The script language is similar to *Crosstalk Mk. 4*'s CASL, with added functions for dynamic data exchange (DDE) support. DDE lets you create dynamic links among multiple programs running in a *Windows* session. The hot-



Crosstalk for Windows, Version 1.1
Digital Communications Associates Inc., 1000
Alderman Dr., Alpharetta, GA 30202-4199;
800-241-4762, 404-442-4000.

List Price: \$195.

Requires: 150K RAM, *Microsoft Windows 2.x* or 3.0.

In Short: *Crosstalk for Windows* is an intuitive *Windows* communications program backed by the solid experience of DCA. The package's extremely user-friendly operation makes it a delight for *Windows* users.

CIRCLE 545 ON READER SERVICE CARD

by screen. The program suspends file transfers, however, while you are in the review buffer looking around—a definite drawback to the package. It redeems itself by allowing you to search for specific words or phrases in the buffer.

On our performance tests, *Communicator* brought in scores at the upper range at all three speeds, matching its higher-end sibling, *Crosstalk Mk. 4*, practically score for score.

DCA provides free technical support for *Communicator* and its other *Crosstalk* products at a toll number. The company also offers a money-saving conversion plan allowing users to upgrade from *Communicator* to *Crosstalk Mk. 4* for \$125, to *Crosstalk for Windows* for \$99, or to *Re-*

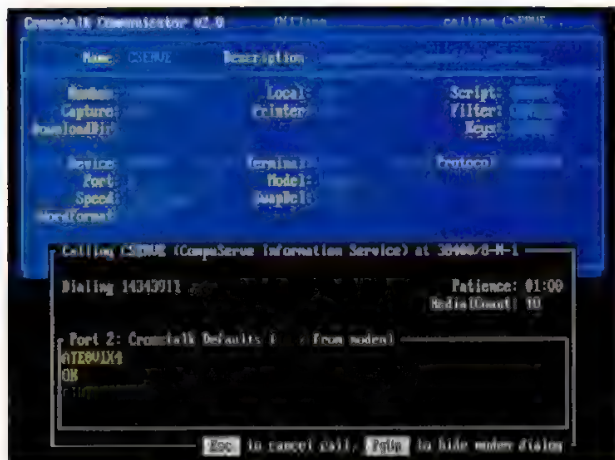
links allow the data in one file to be automatically updated when the data in the other file changes. *Crosstalk for Windows* lets you exchange information between the host session and other *Windows* applications like *Microsoft Excel*. Since DDE is not hard-coded into *Crosstalk for Windows*, you need to use CASL scripts to enable it. Unlike *Mk. 4*'s CASL, the scripting language in *Crosstalk for Windows* lacks support for 3270 terminal emulation.

The most useful tools are the user-defined PFKeys. Setting the macros for these programmable function keys is easy: You simply insert into the connected host system the commands you would normally type, such as your log-on ID, password, or requests to download or log off.

The status bar in *Crosstalk for Windows* contains information like the RTS/CTS flow control sequence, port speed, and setup parameters, as well as a timer for marking the connect time. A brightly colored bar graph helps you monitor the file-transfer progress. Even when minimized, the *Crosstalk* icon still displays pertinent information.

JUST CLICK THE MOUSE

The *Windows* interface in *Crosstalk for Windows* also enables you to interact dynamically with programs running on a called host computer to select options and enter commands. You can use a mouse to click on a menu selection, filename, or word displayed on your screen by a host computer. The program sends this high-



Crosstalk Communicator displays complete status information while dialing a phone number, including the speed, terminal emulation, script, and filter it is using.



“There is very
little more you
can ask for from
a computer.”

— *PC Magazine*
January 15, 1991

But ask anyway!



How about:

☒ Editor's Choice ☒ 33MHz '386 ☒ 128K SRAM
Cache ☒ Up to 32MB Motherboard Memory
☒ Eight Bay Vertical Case ☒ 250 Watt Power
Supply ☒ Twin Cooling Fans ☒ DOS 4.01 &
Windows & Mouse ☒ FCC Class B ☒ 24 Hour
a Day Toll Free Sales and Technical Support

**"The combination is as close to
unbeatable as you can get."**

— PC Magazine

SYSTEMS

Windows and a mouse, plus Microsoft DOS 4.01. All at no additional charge. A rip-roaring Cache, extra Memory and Windows 3.0. What more could there be? From ZEOS, lots more.

ZEOS 24 HOUR A DAY SUPPORT. TOLL FREE.

If you should need assistance, you want your computer company to be there no matter what the hour. That's why ZEOS invented *24 Hour a Day Sales and Technical Support*. We did it for you. And

it's the best in the business. As a ZEOS customer, you are supported around the clock, *any time of the day or night*. With ZEOS you can have complete confidence in support, in your system and in the company.

Because at ZEOS, we not only build our own systems, we design them from the ground up too. Unlike most of the others, ZEOS maintains its own chip level Research and Development Labs plus our own board level manufacturing facility. All right here in St. Paul, Minnesota, USA.

You can buy with confidence too because ZEOS is a strong and rapidly growing public company (NASDAQ Symbol: ZEOS). As a matter of fact, according to *INC. Magazine*, ZEOS is America's 19th fastest growing public company! And, our professional

Systems Consultants and expert Technical Support staff serve tens of thousands of customers World Wide, Twenty Four Hours a Day.

Performance. Quality. Price and Support. And all of it backed by the ZEOS Customer Satisfaction Package which includes our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Parts Replacement Policy. You're going to be very satisfied. We don't just say it. *We Guarantee it!*

ORDER YOUR NEW ZEOS '386 TODAY!

As *PC Magazine* recently said "It's difficult to be more eloquent about the ZEOS '386-33 than it already is about itself." They went on to say ZEOS shows "you needn't be among the most expensive to be the best." We couldn't have said it better ourselves.

Why not pick up the phone and give us a call right now. Your own expert Systems Consultant is waiting here now to help you tailor your new ZEOS '386 to your specific needs. Buying your ZEOS '386 is perhaps the best purchase decision you'll ever make! After all, your satisfaction is absolutely *Guaranteed*.

CALL NOW TOLL FREE

800-423-5891

DON'T FORGET THE OPTIONS!

As *PC Magazine* said, ZEOS offers "more options than even the most configuration hungry hound could possibly need." Because every ZEOS system is custom built you may choose from a huge selection of hard drives, video packages and many other options. On-site service is available too. Call 800-423-5891 for details.

ZEOS '386 SYSTEMS — A FEW EXPERT OPINIONS:

PC Magazine, "Out of 104 machines from 58 companies... For Overall Excellence we selected ZEOS International..."

InfoWorld, "We find the ZEOS '386 an excellent value. Speed: Excellent. Compatibility: Excellent. Value: Excellent."

Government Computer News, "Arguably the fastest MS-DOS and OS/2 micro in the world."

PC Resource, "ZEOS ... provides quality comparable with IBM or Compaq and does so for about 70% of the price."

PC Magazine, Editor's Choice, "The ZEOS blows away every other computer... a smart choice."

**ZEOS '386 SYSTEMS.
A SMART CHOICE
INDEED!**



Get Started Fast and Easy!
ZEOS '386-25 Desktop.
64K Cache, 85MB IDE
drive, 1MB Memory.
ONLY \$2295

This is the place where high performance begins. Your own ZEOS 25MHz '386 caching system. \$2295. Incredible!

- Ultra High Speed 64K SRAM Cache, providing Zero-Wait State performance vastly superior to page/interleave memory schemes.
- Genuine Intel® 80386 25MHz CPU. Full 80387 and Weitek® math coprocessor support.
- 1MB of High Speed DRAM, expandable to a total of 16MB.
- Ultra Fast 85MB IDE Hard Drive, Teac® 1.2MB Floppy Drive.
- ZEOS 14" High Res amber monitor with Tilt/Swivel Base. Includes Genuine Hercules® brand graphics controller.
- ZEOS/RS 101 key SpaceSaver Keyboard.
- ZEOS I/O Card with Two High Speed Serial plus Parallel and Game ports.
- 1-32, 6-16 and 1-8 bit expansion slots.
- Rugged ZEOS 5-bay desktop case with 250 Watt power supply for increased system expandability, an important extra at no additional cost.
- 30 Day Absolute Satisfaction Money Back Guarantee and ZEOS Customer Satisfaction Package.
- One Full Year Limited Warranty with Express Parts Replacement.
- 24 Hour a Day Toll Free Technical Support, 365 Days a Year.

Upgrade from 85MB to 130MB for only \$225 or go up to 200MB for only \$495. Packages with our 130MB standard go to 200MB for only \$270!

PACKAGES



ZEOS '386-25 Desktop!
130MB IDE Drive, 4MB
Memory, 1024 VGA Color,
Windows & More.
ONLY \$3195

For incredible 25MHz speed and power don't miss the ZEOS '386-25 package. Loaded and ready to go!

- Ultra High Speed 64K SRAM Cache. It races right past other 25MHz systems and never looks back!
- Intel® 80386 25MHz CPU. Full 80387 and Weitek® support.
- 4MB of High Speed DRAM, expandable to a total of 16MB.
- Ultra Fast 130MB IDE Hard Drive, Teac® 1.2MB and Teac® 1.44MB Floppy Drives.
- ZEOS 14" High Res 1024x768 VGA Color monitor with Tilt/Swivel Base plus High Speed 16-bit VGA 1024 color graphics card with 512K video RAM.
- ZEOS/RS 101 key SpaceSaver Keyboard.
- ZEOS I/O Card with Two High Speed Serial plus Parallel and Game ports.
- 1-32, 6-16 & 1-8 bit expansion slots.
- Rugged ZEOS 5-bay desktop case with 250 Watt power supply for increased system expandability, an important extra at no additional cost.
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse!
- Full ZEOS Satisfaction Package.

ZEOS '386 33MHz Vertical
system. Perhaps the fast-
est in the world! 130MB
IDE, 4MB Memory, 128K
Cache, VGA Color &
Options Galore.
ONLY \$3695

You simply cannot buy a better 33MHz '386 system. Feature for feature nothing can touch the ZEOS '386-33!

- Ultra High Speed 128K SRAM Cache. Coupled with the fastest motherboard on the market. Unbelievable performance. Believe it!
- Genuine Intel® 80386 33MHz CPU. Full 80387 and Weitek® math coprocessor support.
- 4MB of High Speed DRAM, expandable to a whopping 32MB on the motherboard.
- Ultra Fast 130MB IDE Hard Drive, Teac® 1.2MB and Teac® 1.44MB Floppy Drives.
- ZEOS 14" High Res 1024x768 VGA Color monitor with Tilt/Swivel Base plus High Speed 16-bit VGA 1024 color graphics card with 512K video RAM.
- ZEOS/RS 101 key SpaceSaver Keyboard.
- ZEOS I/O Card with Two High Speed Serial plus Parallel and Game ports.
- 2-32 and 6-16 bit expansion slots.
- Rugged ZEOS 8-bay vertical case with 250 Watt power supply for maximum expandability.
- Two cooling fans for added reliability and increased component life.
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse!
- 30 Day Absolute Satisfaction Money Back Guarantee and ZEOS Customer Satisfaction Package.
- One Full Year Limited Warranty with Express Parts Replacement.
- 24 Hour a Day Toll Free Technical Support, 365 Days a Year.

ORDER NOW TOLL FREE
800-423-5891

Fax Orders Dial: 612-633-1325
 In Minnesota Call: 612-633-4591
 Outside US/Canada: 612-633-6131
 MasterCard, VISA, Discover, AmExp,
 Z-Card and COD.

ZEOS '386 Systems.

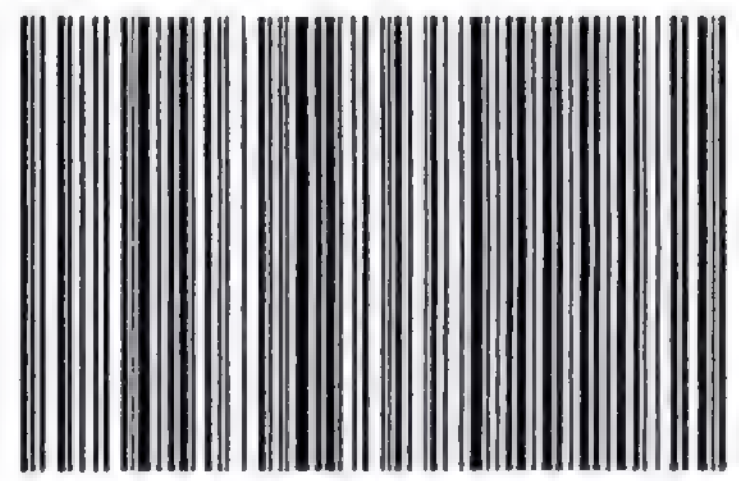
~~Five~~
~~Four~~ Times
Editor's Choice

“Deserving of this award is
the ZEOS 386-33 with its superior
combination of performance,
expandability, and price.”

— *PC Magazine, On Why the ZEOS
386-33 Wins Editor's Choice.*

Call Now!
800-423-5891

Inverted Foldout slip-sheet

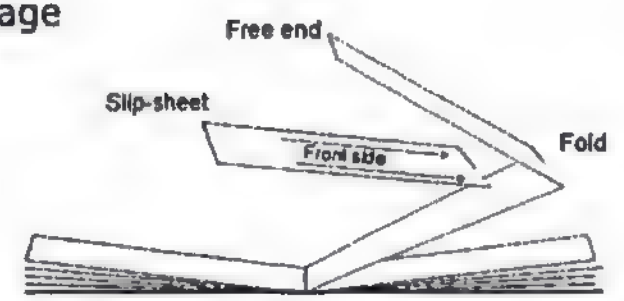


GbsSlipSheet-001

Folded edge of the page

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page

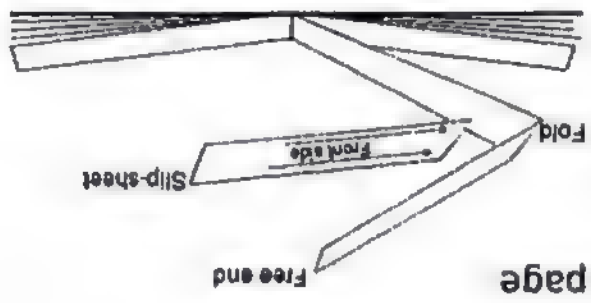
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

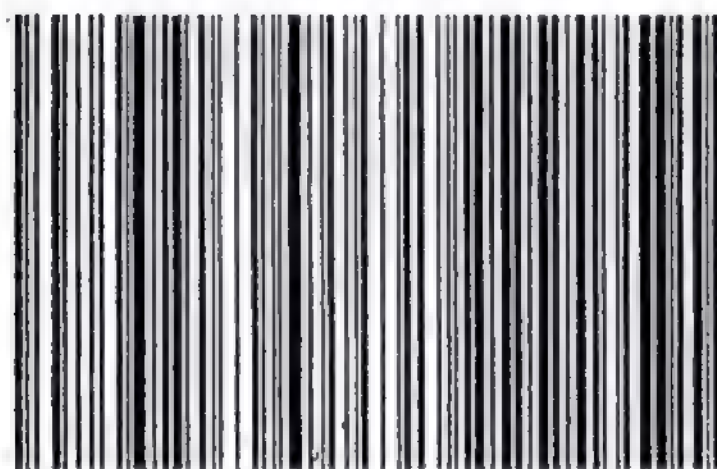
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-0018

Back

1. Follow instructions on the other side



Take it from the experts. ZEOS builds the best '386 systems! "Quality comparable with IBM or Compaq... Excellent Value... Blows away every other computer... ZEOS is top drawer... Unbeatable... Top Honors... A smart choice!"

The industry experts love ZEOS systems.

And you will too. Why?

Because ZEOS really does build the very best '386 systems you can buy. In naming the ZEOS '386-33 *Editor's Choice*, *PC Magazine* said ZEOS shows "that you needn't be among the most expensive to be the best." But what does that mean to you?

It means that when you purchase your new ZEOS '386 you will receive more Performance, superior Quality, and better Support than you can get anywhere else. Take performance for instance.

CACHE MEMORY MEANS PERFORMANCE!

That's why each and every ZEOS '386DX system has a minimum of 64K SRAM Cache standard; *our 33MHz screamers come standard with a 128K*

Cache. Having an on-board memory cache is important in realizing the full potential of any '386 processor. That's why only low end '386DX systems are sold without a Cache. That's why ZEOS gives you a Cache, and all the extra performance that comes with it!

And it's not only the Cache that's fast, so is everything else. In choosing the ZEOS '386-33 as *Editor's Choice*, *PC Magazine* noted "ZEOS International designed this machine for speed—and came up with a system that topped four of our benchmark tests and excelled on the remaining ones." Designed for speed. Absolutely.

Speaking of speed. Standard in your new ZEOS '386 will be one of our *incredibly fast* 85MB or 130MB IDE hard drives. These babies were designed for the '386 and they come packing all the speed you'll need. Like *PC Magazine* said, ZEOS designs for speed. And for Quality Too.

ZEOS QUALITY. SECOND TO NONE.

When you buy your new ZEOS system you are buying *absolute Quality*. As an example, every ZEOS '386DX system comes with a 250 Watt power supply. They cost more, they're better too. Much Better. We invest more in our power supplies to help assure you years of trouble free operation. Even the small details can make the difference.

Like our floppy drives. We use only genuine Teac®. They are the best money can buy. The same is true of *all* the components of your system. Only *the very best* are used. Everything is top notch. Top quality. Top Value.

You'll especially like the value you find in our money saving ZEOS system packages. And when you opt for any package with 4 Megs of memory, we also include the new version of Microsoft®

Sim
the F

10 Good Reasons To Buy From ZEOS®

Reason #1

"Overall Excellence."

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but five times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

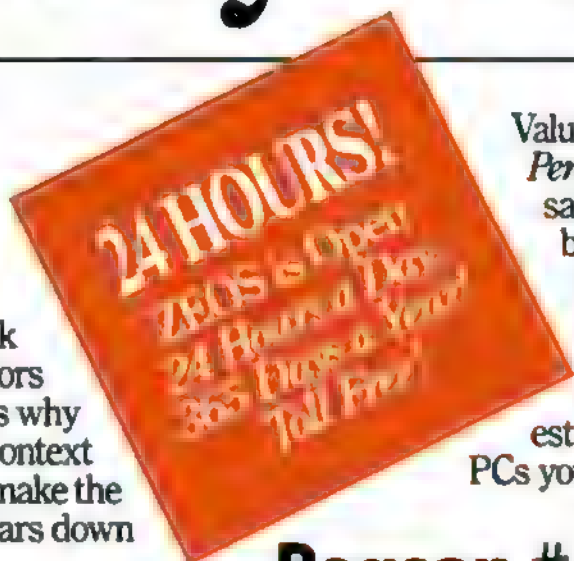
Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed: Excellent. Compatibility: Excellent."



Value: Excellent."

Personal Computing said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."

Reason #5

Warranties and Guarantees.

ZEOS believes in its products. That's why we offer each and every customer our 30 Day Absolute Satisfaction Money Back Guarantee, no questions asked. Plus, our One Full Year Limited Warranty and Express Parts Replacement Policy. Optional On Site Service is available too. Call for details.

Reason #6

24 Hour Toll Free Technical and Sales Support.

At ZEOS, the customer is #1. That's why we invented 24 Hour a Day Tech Support. For *your* convenience. If you buy a product from us we feel we should be there to help, any time of the day or night. Give us a call Toll Free! 800-423-5891. Anytime!

Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.

Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

Reason #9

Easy to Buy.

ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, Discover, American Express, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

And now the Z-CARD! It's your very own ZEOS Credit Card and you can apply today. With the Z-CARD you can charge your ZEOS purchases and pay in easy monthly installments. It's just like a Bank Card. Why not apply for your Z-CARD now!

Reason #10

You're Going to be Very Satisfied.

When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, we *Guarantee it!*

FAX Orders Dial: 612-633-1325
In Minnesota Call: 612-633-4591
MasterCard, VISA,
Discover, AmEx,
Z-Card and COD
Open 24 Hours a
day, 365 Days
a year.

Order Now
Toll Free



800-423-5891

Apply Now for the Z•CARD!

NO ANNUAL
FEE!

SEND FOR YOUR ZEOS CREDIT CARD



■ Low Consumer Rate!

■ No Annual Fee!

Now you can send for your own ZEOS Credit Card. It works just like a MasterCard or Visa for ZEOS purchases.

Fill out your Z•Card™ Application and mail it today to
ZEOS International, Z•Card

Processing Center, 530 5th Avenue

N.W., St. Paul, MN 55112. We'll give you a call

as soon as your credit line is established!*

Please complete all appropriate sections, *providing at least two years residence and employment history.* **THIS IS NOT A CREDIT AGREEMENT!** One will be sent to you upon authorization of an account. (This Form Must Be Signed To Process Your Order.) All Financed Purchases Are Subject To Credit Approval. **If You Have Any Credit Questions, Please Call 800-421-8942 For Assistance. Thank You!**

A married person may apply for individual credit. I am applying for (please check appropriate box):

☐ **JOINT CREDIT** with another person.
Complete entire application.

☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested.
Complete entire application.

☐ **INDIVIDUAL CREDIT.**
Do not complete Section C.**

**If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

NOTICE TO WISCONSIN APPLICANTS:
YOU MUST DISCLOSE YOUR MARITAL STATUS:

☐ married ☐ unmarried ☐ legally separated

A. YOUR PERSONAL INFORMATION

Name _____
Home Phone (_____) _____
Soc. Sec. No. _____ Date of Birth ____/____/____
Address _____ Apt. _____
City _____ State _____ Zip _____
Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____
Previous Address _____
City _____ State _____ Zip _____
Employer _____ Since? (Mo./Yr.) _____
Monthly Gross Salary \$ _____ Daytime Bus. Phone (_____) _____
Previous Employer _____ From - To _____
Occupation _____
Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation.
Additional Monthly Income \$ _____ Source: _____
Name & Address of Nearest Relative Not Living With You _____
Relationship _____

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE: Checking Account ☐ Yes ☐ No
Savings Account ☐ Yes ☐ No

	Y/N	How Many?	Y/N	How Many?
Bank Loan	_____	_____	_____	_____
Dept. Store Charge Card	_____	_____	_____	_____
VISA	_____	_____	_____	_____
Credit Union Account	_____	_____	_____	_____
MasterCard	_____	_____	_____	_____
Other Major Charge Cards	_____	_____	_____	_____
Finance Company Loan	_____	_____	_____	_____

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____
Soc. Sec. No. _____ Date of Birth ____/____/____
Address _____ Apt. _____
City _____ State _____ Zip _____
Home Phone (_____) _____ Date of Residence (Mo./Yr.) _____
Joint Applicant's Employer _____ Since? (Mo./Yr.) _____
Bus. Phone (_____) _____ Monthly Gross Salary \$ _____

CUSTOMER AUTHORIZATION

I authorize ZEOS International, Ltd. or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct to the best of my knowledge and belief.

Applicant's Signature _____
Date _____

Joint Applicant's Signature _____
Date _____

FOR MARRIED WISCONSIN APPLICANTS:
I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family.

Buyer's Signature _____ Date _____

There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or 612-635-0613 or write to ZEOS, Z•Card Processing Center, 530 5th Avenue N.W., St. Paul, MN 55112.

NY—A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

OH—THE OHIO LAWS AGAINST DISCRIMINATION REQUIRE THAT ALL CREDITORS MAKE CREDIT EQUALLY AVAILABLE TO ALL CREDITWORTHY CUSTOMERS AND THAT CREDIT REPORTING AGENCIES MAINTAIN SEPARATE CREDIT HISTORIES ON EACH INDIVIDUAL UPON REQUEST. THE OHIO CIVIL RIGHTS COMMISSION ADMINISTERS COMPLIANCE WITH THIS LAW.

*Financing not available in Alaska, Hawaii or outside the continental U.S.

TAILOR-MADE COMMUNICATIONS

by Barry Simon

When you access a communications service like PC MagNet, you save time and money by automating your on-line activity. In principle, the script feature of a good communications program should allow you to automate the processes of collecting mail, sending mail, and dealing with public messages and file downloads. But the services are often so vast that making scripts work with them requires a lot of time programming and experimenting. It pays to try a tailor-made solution instead.

Many communications programs come with scripts for accessing CompuServe and MCI Mail, but they typically do little more than set parameters and log you on. A few third-party scripts for specific programs automate message processing. For example, two full-featured free scripts for accessing CompuServe are EJRYAM for *Professional YAM* and CISOP for *Crosstalk Mk. 4* and *Crosstalk Communicator*. You'll find them in CompuServe, in library nine of the IBMCOM forum and library six of the Crosstalk forum, respectively. Because PC MagNet is linked to CompuServe and uses the same system software, these scripts and the programs mentioned below can also access PC MagNet.

Most regular users of a service will want to consider a communications program specific to that service. There are three DOS-compatible automated access programs for CompuServe: *AutoSIG (ATO)*, *The Access Program for the CompuServe Information Service (TAPCIS)*, and the *CompuServe Information Manager (CIM)*. GENIE lets you use its own *GENIE PC Aladdin*, and MCI Mail can be accessed via *Lotus Express*. Some services, such as IBM's Prodigy and PC Macnet (which is different from PC MagNet!), provide proprietary software that must be used for access.

GENERAL AUTOMATED FEATURES

What should you look for in such programs? Expect a built-in message editor to allow composition of messages offline. It should let you see the message to which you are replying and present a list of mail messages with sender and subject indicated. Also look for some mechanism to organize your mail and automate mailing of binary messages.

An address-book feature means you don't have to remember other users' ID numbers. An address book should make it easy for you to add the name of someone who sends you a message and to set up groups of recipients for a common mailing.

For the public bulletin-board services, the program should let

you access a list of current topics, mark those of interest, and download the messages for reading or answering offline. For services with software libraries, you should be able to search for a name or keyword and mark programs for downloading.

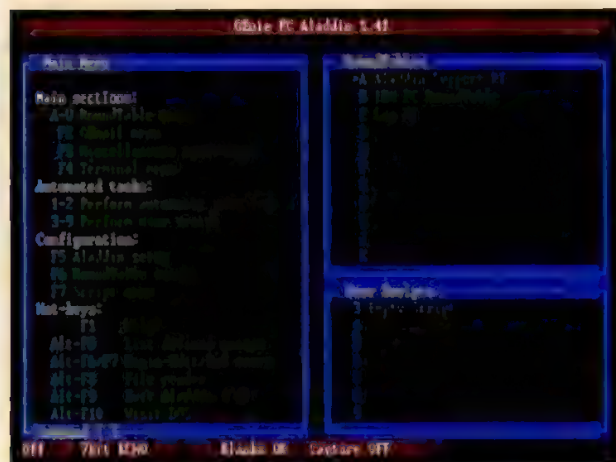
THE PARTICULARS

Lotus Express, priced at \$150, is the most popular MCI Mail-specific access program. It lets you attach binary files to messages and offers easy-to-use *Lotus*-style menus and message lists, but it contains many flaws. It runs only as a TSR and often conflicts with other TSRs. You can't easily view a message to which you are replying, and although you can set up a kind of address book, it has no search capability. So why use *Express* instead of *Norton Commander* or *PC Magazine's* own *EMMA* utility, which also transfer binary files over MCI Mail? Simple—unlike the others, it provides adequate filing capabilities, letting you sort mail into coherent groups for later reference.

TAPCIS, a \$79 shareware product available on CompuServe's TAPCIS forum, and *ATO*, a free labor of love from CompuServe's IBMNET sysops available in library 1 of the IBMCOM forum, provide similar message handling. They obtain the names of current message-thread topics from several forums and



Even though CompuServe's *CIM* runs in character mode, its use of overlapping windows gives it a slick GUI flavor.





Not surprisingly, *Lotus Express* offers a familiar *Lotus 1-2-3*-style menu, which you can access with the F10 key. The software runs only as a TSR, however, and it often conflicts with other TSRs.

let you mark topics of interest off-line. The programs log back on to capture marked messages for you to read and answer off-line. But you can't get a simple list of messages in a file and easily jump between them. And while you can send a mail message to several different recipients, there's no simple way to reply to carry on a group mail dialogue. Unfortunately, neither program provides all that much in the way of message-organizing tools.

So which is better: *TAPCIS* or *ATO*? The question has been debated throughout CompuServe in discussions that make the Thirty Years War seem mild. *ATO*'s price can't be beat and it offers a more powerful script language, while *TAPCIS* provides direct links to the various forum libraries and allows seamless transfer of binary files via CompuServe Mail.

Moreover, a thriving cottage industry of *TAPCIS*-specific add-ons considerably enhances the product. *TappeT* remembers which topics you read the last time you logged on and points out topics that match keywords you've specified. *RECON* sorts files by grouping together messages on the same topic, even if they're from several downloads.

Both *TAPCIS* and *ATO* contain some-

what dated interfaces based on static menus with function-key or letter-key options. In contrast, the *CompuServe Information Manager (CIM)*, CompuServe's own \$24.95 program, offers a slick windowing interface. It lets you place messages in electronic folders and displays trees of message threads to help you keep track of sub-threads. But *CIM* forces you to read more material on-line with the clock running and doesn't let you

mark threads off-line for downloading later. Still, since the price of the package does include a \$15.00 usage credit, the program is very cheap and may be worthwhile for automatically accessing other CompuServe facilities, such as stock quotes. Like CompuServe, *GENie* offers message areas, called RoundTables, and includes a private mail area. *Aladdin*, a free program from *GENie*, resembles *ATO* or *TAPCIS* to the extent that *GENie* resembles CompuServe. The differences reflect *GENie*'s anomalies. For example, *GE Mail* supports carbon-copy lists for mail, so with *Aladdin*, it's easy to carry on conversations with a group. You can configure *Aladdin* to check on certain RoundTables only on certain days of the week; it also includes a full-featured script language and some handy keyboard macros.

All the programs have flaws of some kind, but they are much better than rolling your own. If you use on-line services, you'll surely want to try these automated programs to reduce your time and expense.

AutoSIG (ATO), Version 6.3a
CompuServe IBMCOM forum, library 1 (on-line distribution only).
List Price: Free. **Requires:** 256K RAM, DOS 2.0 or later (DOS 3.0 or

later recommended), modem.

CIRCLE 609 ON READER SERVICE CARD

CompuServe Information Manager (CIM), Version 1.22
CompuServe, 5000 Arlington Centre Blvd., Columbus, OH 43220; 800-848-8199, 614-457-8600.

List Price: \$39.95 retail (includes \$25.00 usage credit); \$24.95 on-line (includes \$15.00 usage credit).
Requires: 640K RAM, DOS 2.0 or later, modem.

CIRCLE 610 ON READER SERVICE CARD

GENie PC Aladdin, Version 1.41
General Electric Information Services, 401 N. Washington St., Rockville, MD 20850; 800-638-9636, 301-340-4000.
List Price: Free. **Requires:** 512K RAM, DOS 3.0 or later, modem. Hard disk recommended.

CIRCLE 611 ON READER SERVICE CARD

Lotus Express, Version 2.0
Lotus Development Corporation, 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8500.
List Price: \$150. **Requires:** 320K RAM, DOS 2.0 or later, modem.

CIRCLE 612 ON READER SERVICE CARD

RECON, Version 1.80
Optimal Solutions, distributed by Public Software Library, P.O. Box 35705, Houston, TX 77235-5705; 800-242-4775, 713-524-6394.
List Price: \$35. **Requires:** 384K RAM, DOS 2.0 or later, *TAPCIS*, modem.

CIRCLE 613 ON READER SERVICE CARD

The Access Program for the CompuServe Information Service (TAPCIS), Version 5.3
Support Group Inc., Lake Technology Park, McHenry, MD 21541; 800-872-4768, 301-387-4500.

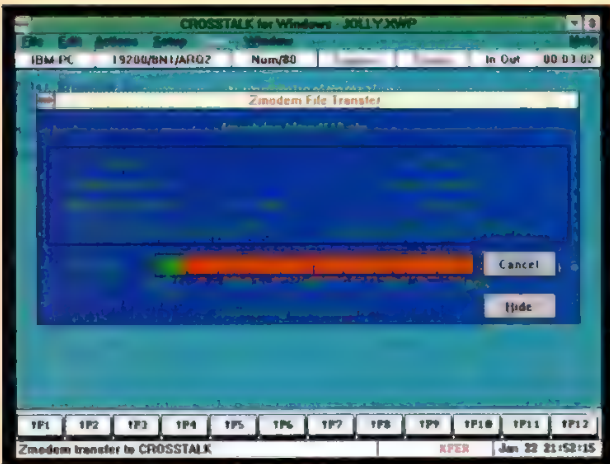
List Price: \$79 registration fee. **Requires:** 384K RAM, 720K disk space, DOS 2.0 or later, modem.

CIRCLE 614 ON READER SERVICE CARD

TappeT, Version 1.30
Source Code Systems, 19 Hartwell Rd., Bedford, MA 01730; 617-275-7256.

List Price: \$24 registration fee. **Requires:** 256K RAM, DOS 2.1 or above, *TAPCIS*.

CIRCLE 615 ON READER SERVICE CARD



Crosstalk for Windows displays a colored bar graph showing the percentage of completion of a file transfer, along with an estimate of throughput and time remaining. A status bar represents information such as flow control sequence, port speed, and setup parameters.

lighted word back to the host to use as input to the command line or menu in a program running on the host.

Starting the program is a breeze. With *Microsoft Windows* 3.0 up and running, you run the install program and set the defaults by answering simple yes-or-no questions. You can set your modem parameters from a list of 34 modem setup strings. The inherent ease of *Windows* makes phone-book entries simple to create and change with just a click of the mouse button.

Communications parameters include the usual choice of one of four communications ports, plus specifications for parity checking, hardware handshaking, data bits or word size, and stop bits. The transmission rate ranges from 1,200 to 19,200 bits per second.

Terminal emulation includes ANSI as well as IBM 3101 and DEC VT52 and VT102. The program also supports Videx terminal emulation, a special CompuServe option that allows a program to display multiple graphics windows, such as weather and aviation maps, on-screen simultaneously. Make sure you change your CompuServe terminal options to support Videx.

The file-transfer protocols in *Crosstalk for Windows* include CompuServe B,

CrossTalk, Dart, Kermit, XModem, XModem 1K, and YModem-batch. Dart, like ZModem, features fast throughput and recovery after file-transfer interruption. Although the software includes ZModem, the documentation doesn't mention it. At 19.2 Kbps, there were no speed differences to speak of among any of the *Windows*-based products on our performance tests.

You need to specify disk size when ordering, since the package comes with either 5.25- or 3.5-inch disks, not both. DCA offers free customer support; the user pays for the cost of the telephone call. The company also provides a 90-day warranty.

Once again, DCA has given us a leading-edge product for communications. *Crosstalk for Windows* combines proven *Crosstalk* functionality with *Windows*' ease of use. With more corporations moving to the *Windows* environment, *Crosstalk for Windows* is ready to fill the niche.

Crosstalk Mk. 4, Version 2.0

by Sara Parker

A top-notch program that does almost everything and does it all right, *Crosstalk Mk. 4* provides a total communications package. Its \$245 price is a real bargain for everything it accomplishes. With 21 terminal emulations and *Crosstalk's* powerful application scripting language, CASL, *Mk. 4* is not for the casual user; less costly communications products are avail-

able without Mk. 4's more-encompassing features.

Power users can benefit from *Mk. 4's* many features, especially CASL. If you already have programming experience with C or Pascal, you won't find CASL difficult. The CASL reference included with *Mk. 4* is well written, understandable, and extensive; it includes a whopping 347 verbs. If you develop scripts in *Mk. 4* but your coworker prefers the easier-to-use *Crosstalk Communicator*, that's fine. You can use the same scripts with *Communicator*.

One file management script in the package, DOS Menu, offers features such as sorted directory listings and a file-finding utility. *Mk. 4* also comes with canned communications scripts for connecting with MCI Mail, CompuServe, Dow Jones News/Retrieval, and OAG.

HOW MUCH XTALK DO YOU WANT?

Installing *Mk. 4* is similar to installing the other *Crosstalk* products. With *Mk. 4*, however, you first need to decide how much of the program you want. With all of

SUITABILITY TO TASK

Crosstalk Mk. 4

Mini and mainframe connections				
Automated information retrieval				
Systems and calls management				

the files loaded, *Mk. 4* uses approximately 1.2MB of hard disk storage, but only if you're programming scripts do you need to have such a large amount loaded.

The easy setup offers selections for one of four COM ports for ATs and XTs, and one of eight COM ports for PS/2s. The transmission rates range up to 115,200 bits per second. You can select word size, stop bits, break length, and flow control, and you can turn on both software and hardware flow control. The program offers 40 useful predefined modem setup strings.

LOTS OF CONNECTIONS

Crosstalk Mk. 4 supports a staggering 21 terminal emulation types, including DEC VT52, VT100, VT102, VT220, and VT320, as well as ANSI, IBM 3101, and TTY. This wide range guarantees connections to more host services than almost any other product reviewed.

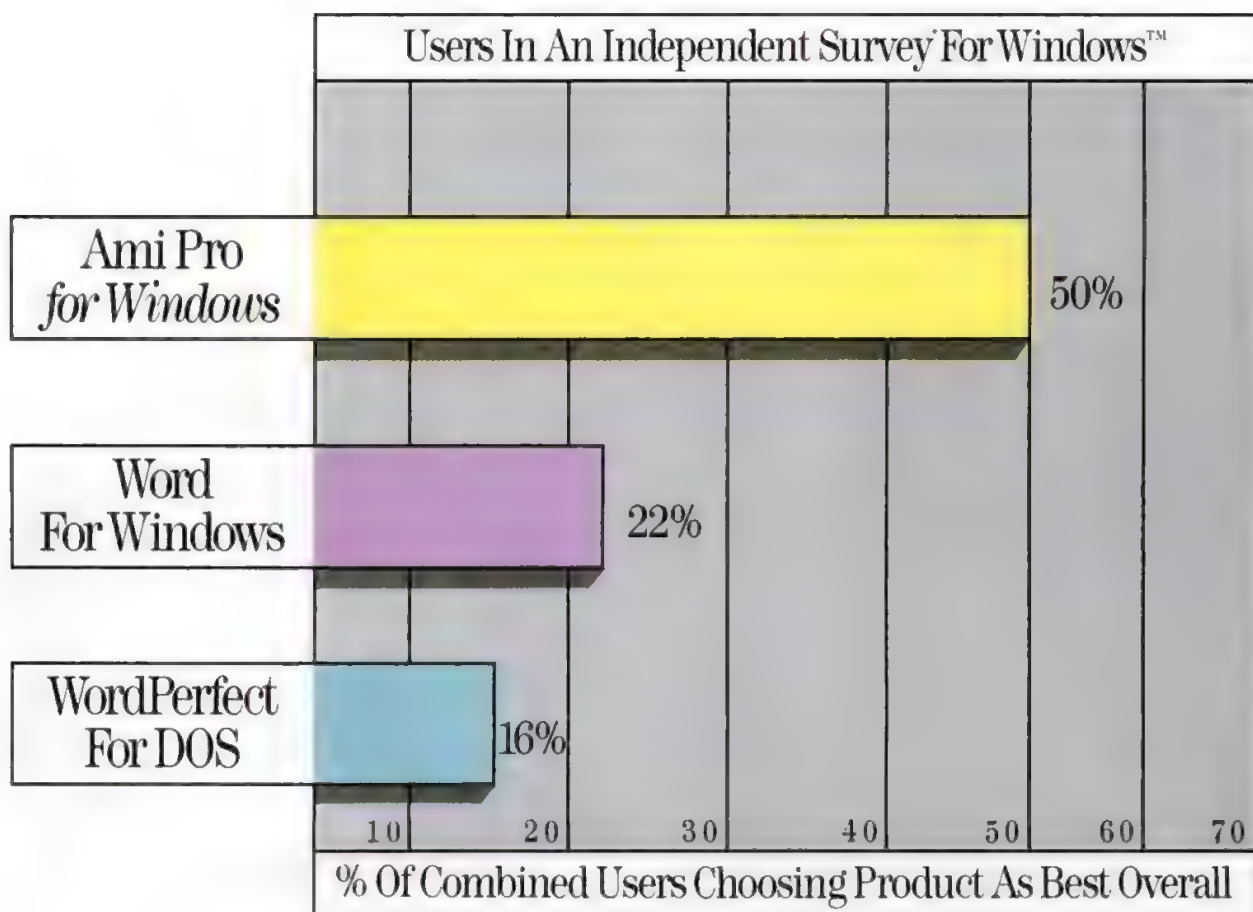
As *Mk. 4* transfers a file, a bar graph

SUMMARY

Crosstalk for Windows

Mini and mainframe connections				
Automated information retrieval				
Systems and calls management				

There's only one word processor for Windows that's winning it all.



*Independently conducted Windows word processing Usage & Attitude Study, November, 1990. Figures cited are among Word for Windows users that are also users or triers of Ami Pro.

Ami Pro is winning

Preferred nearly 2:1
for quality of output.



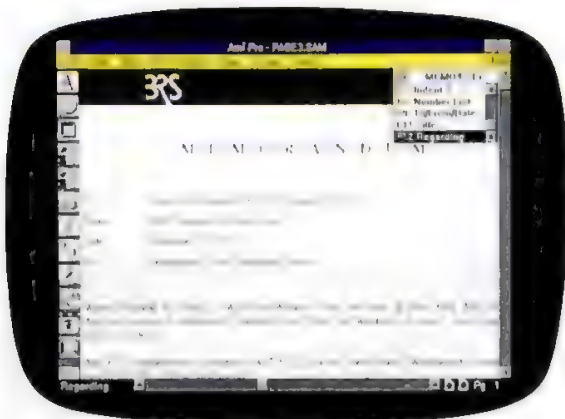
Try Ami Pro™ for Windows™ just once, and you'll see why users prefer it by such wide margins over other word processors. With more than 360 powerful features, and its incredibly flexible formatting tools, it's not surprising that Ami Pro has unmatched quality in printed output.

Preferred more than
2:1 for ease of use.



Only Ami Pro makes word processing this easy, with features like truly interactive WYSIWYG that lets you edit in any of four page views, including full page view.

Preferred nearly 2:1
for productivity.



With all the features of a serious word processor, Ami Pro even comes with over two dozen pre-set style sheets for fast, professionally designed letters, reports, memos and more.

Preferred more than 10:1
for graphics generation.



With its built-in graphics Ami Pro can instantly generate 168 varieties of presentation-quality charts and graphs. Just type in data, or import it from programs like Lotus® 1-2-3.*



Pick a winner.

Automatic Backup Automatic Timed Save

Block Manipulation

Bookmarks

- Named By User • Go To

Charting

- 3D Charting • Edit Chart with Draw Tools
- Legends • Multiple Styles Per Type • 7 Chart Types

Copy Text and Graphics

Cursor Movement

- Begin/End of File • Character • Line • Page
- Paragraph • Sentence • Top/Bottom of Screen • Word

Customizable Icon Bar

- Choose From Over 45 Functions • Quick Access to Features

Customizable View Level

- 10-400% • Fully Editable

Cut and Paste

Date Insertion

- Today's Date • Date Printed • Date Last Edited • Definable Style

DDE (Dynamic Data Exchange)

- Two-way • Paste Link • Text and Graphics
- Via Macro Language

Defaults

- Backup Options • Date Styles • Dictionary Paths • Display Options • Document Path
- Draft Mode Colors • Footnote Options
- Hyphenation Hot Zone • Pair Kerning • Printer
- Icon Bar Icons • Undo Levels • View Level

Delete

Dialog Boxes

Document Annotation

- Notes • Show/Hide • Go To Notes • Date/Time Stamp • Stacked Notes

Document Descriptions

- Author Name • Operator Name • Revision Number • Creation Date • Revision Date
- Renameable Fields • User Defined Fields
- Display with Directory • Print with Document

Drawing

- Cut/Paste Objects • Circles • Arcs • Squares
- Rectangles • Rounded Boxes • Diagonals
- Polygons • Polylines • Group Objects
- Snap-To Grid • Fill Patterns • Line Widths
- Text Rotation • Type Text

File Import/Export

- AdvanceWrite • ASCII • DBase • DCA Final Form • DCA Reversible Form • DIF • E-Mail
- Enable • Lotus WKS WK1, WK3 • Microsoft

- Word • Microsoft Word for Windows • Multi-mate • Navy DIF • Peachtext • Rich Text Format • Samna Word • Windows Write
- WordPerfect • WordStar • Wordstar 2000

File Management Functions

- Copy • Rename • Delete • Move • Sorted File Listing

Font Control

- Unlimited Number of Fonts • WYSIWYG
- Limited Only by Printer

Footnotes

- Auto Numbering • Bottom of Page • Endnotes • Number Style Option • Reset Number Option • Separator Line

Forms Capability

- Format Complicated Forms • Fill-In-On-Screen
- Print on Preprinted Form • Protect Areas

Frames

- Anchor to Text • Auto Text Wrap Around
- Background Shade • Contain Text or Graphics • Fixed Position On Page • Lines Around • No Text Wrap Around • No Text Wrap Beside • Overlay Frames • Repeat on Multiple Pages • Resize Frames

Glossary

- Large Record Size • Speed Key Access

Go To

- Any Page Number • Fast Next Item Access
- Go To Frame, Footnote, Note, Various Marks in Document

Graphics Control

- Edit PIC Files • Drop Anywhere on Page
- Float Graphic w/Text • Place in Box • Proportional Scaling • Fit in Frame • Rotate in Single Degree Steps • X-Y Scaling • Gutter/Binding Margins

Graphics Import

- CGM • EPS • HPGL • Lotus PIC • PCX
- TIFF • WMF

Hard Space

Headers/Footers

- Alternating • Floating

Help

- CBT Tutorial Available • Context-Sensitive
- Indexed • Point & Shoot • Hypertext Linked
- Full Macro Documentation On-Line

Hyphenation

- As-You-Type • Soft Hyphen • Consecutive Hyphen Control • On Paragraph Basis • Hot Zone

Image Processing

- Control Brightness, Contrast of Scanned, Gray Scale TIFF Pictures • Sharpen Edges

- Smoothing • Invert Image

Index Generation

- Generate from List • Mark in Text • Multiple Level Indexing • Hyper Links from Index Back into Document

Insert/Typeover

Kerning

Line Numbering

Line Spacing Control

Macros/Programming Language

- On-Line Macro Documentation • Record/Play • Assign to Function Key • Assign to Menus • Create Menus • Variables • If • Go To Statements • Case Statements • For/Next
- Prompt for Input • Subroutines

Math Calculations

Measurements

- Centimeters • Inches • Picas • Points

Merge

- From ASCII Files • From Comma Delimited Files • From DIF Files • From WK* Files • From dBase Files • From Ami Pro File • Label Print Function • Preview Before Print • Three-Level Boolean Conditional Record Inclusion

Open Multiple Documents

Page Breaks

- Manually Inserted • With Paragraph Style

Page Formatting Control

- Margins • Page Size • Snaking Columns
- Line Around Page • Line Between Columns
- Portrait/Landscape

Page Numbers

- Any Location on Page • Reset Page Number
- Five Formats for Number

Paragraph Styles

- Quick Access with Styles Box • With Function Key • Controls: Font, Alignment, Spacing, Page Breaks, Ruling Lines, Bullets, Numeric Format in Table, Hyphenation

Printing Color

Print Options

- Over 130 Printers Supported • Number of Copies • Page Range • Reverse Order
- Collate • Print Document Description • Crop Marks • On Preprinted Form • Printer Bin Control for First/Rest Pages • Portrait or Landscape

Real-Time Pagination

Revert to Saved Version

Search and Replace

- Case Insensitive • Forward or Backward
- Header/Footer/Footnote • Skip • Replace

- Replace All • Search for Style • Search by Attribute • Wildcards

Section Outline Numbering

- 6 Levels • Number Paragraphs • Numbered Lists • User-Defined Reset

Snaking Columns

- Up to 8 Columns • Column Balancing • On Screen • Variable Width • Variable Spaced

Sort

- Alphabetic • Numeric • Ascending • Descending • By Paragraph • By Word • By Number of Lines • 3 Levels—3 Words Within each Level

Spelling Check

- 130,000 Word Dictionary • Add to Dictionary
- Correct Multiple Occurrences • Entire Document • Selected Text • International Dictionaries • Rest of Document • Skip All Occurrences • Statistics Report • Unlimited User Dictionary Size

Status Line

- Column Number • Document Name • Insert/Typeover • Line Number • Page Number

Style Sheets

- 27 Professionally Designed • Control All Formatting in Document • Document-Only Styles • Global Styles

Tables

- Up to 256 Columns • Column Width Control
- Row Height Control • Auto Row Height
- Lines around Cells • Shaded Cells • Connected Cells • Formulas: Four-Function Math, Sum Function, Absolute/Relative Cell Address
- Insert Rows and Columns • Numeric Alignment and Formatting

Table of Contents

- 3 Levels • Separator Choice

Tabs

- Center • Leader Dot • Left • Numeric • Right

Text Enhancements

- Bold • Double Underline • Initial Caps • Italic
- Lowercase • Overstrike • Small Caps • Subscript • Superscript • Underline • Uppercase
- Word Underline

Thesaurus

- 14 Million Alternatives • Definitions • Gives Inflections • Synonyms

Undo

- Four-Level • Customizable

Unlimited Document Size

Vertical Centering

Widow/Orphan Control

Word Count

Upgrade
now for
\$129⁰⁰
or give it a whirl, FREE.

With all these advanced features, you couldn't ask for a more powerful or easier to use word processor than Ami Pro.

Now, for a limited time,* if you're currently using WordPerfect®, Microsoft® Word, DisplayWrite®, Multimate®, WordStar® 6.0 and earlier, WordStar® 2000, OfficeWriter® or Samna® Word IV,™ see your participating reseller for a great deal on upgrading to Ami Pro. Or call our toll free number and upgrade for \$129.00.

If you're just moving into Windows, you can give Ami Pro a try by getting a copy of our free working model.** So buy it or try it. Either way, you'll be picking a winner.

Call 1-800-831-9679
1-800-668-1509 in Canada

Ami Pro *for Windows*
from
Lotus®

CIRCLE 143 ON READER SERVICE CARD

© 1991 Lotus Development Corporation. All rights reserved. Lotus and 1-2-3 are registered trademarks of Lotus Development Corporation. Ami Pro is a trademark of Samna Corporation, wholly owned subsidiary of Lotus Development Corporation. Windows is a trademark of Microsoft Corporation. All other trademarks are the property of their respective holders.

*Offer expires April 30, 1991. **The working model comes with its own Windows demo version and lacks some features including thesaurus, spell checker and ability to save files.

COMMUNICATIONS ASYNCHRONOUS



Crosstalk Mk. 4, Version 2.0
Digital Communications Associates Inc., 1000 Alderman Dr., Alpharetta, GA 30202-4199; 800-241-4762, 404-442-4000.
List Price: \$245.

Requires: 320K RAM, hard disk, DOS 2.1 or later.

In Short: *Crosstalk Mk. 4* proves that a sophisticated and powerful communications program can be easy to learn and user-friendly. Combine the compilable script language and the large number of terminal emulations supported, and you have one of the best high-end communications software packages on the market today.

CIRCLE 946 ON READER SERVICE CARD

displays to keep you informed of the progress of the transfer. *Mk. 4* supports background operation and provides numerous file-transfer protocols: CompuServe B, CompuServe B Plus, CrossTalk, Dart, Hayes Fast, IND\$FILE, Kermit, Super Kermit, XModem, YModem-G, and ZModem, among others. IND\$FILE protocol works on 3270 terminal emulation connections. The Dart and ZModem protocols make file transfers especially easy because they start automatically when they recognize the command from the host system. On *Crosstalk Mk. 4*, you'll need to select the other protocols manually, which increases the overall file-transfer time,

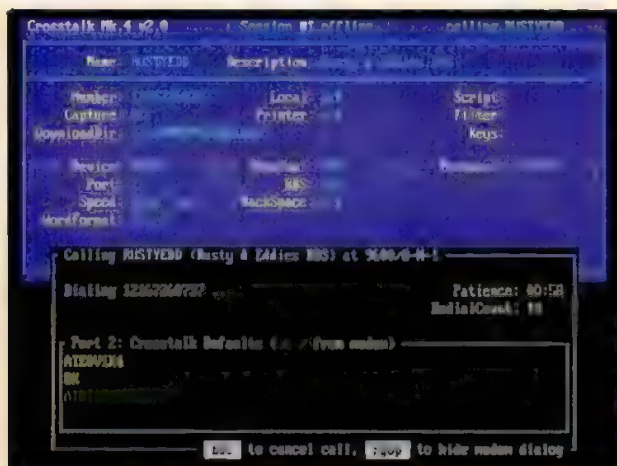
but not appreciably. *Mk. 4* users can choose from a variety of interfaces, including menus, a command interface, and key combinations.

The program includes a range of other features. For one thing, it can operate as a host for callers. It also provides password security for local operations, and the ability to log calls. A text editor with search-and-replace facilities and a scroll-back buffer also enhances the system. *Mk. 4* also supports Novell's NASI and NetBIOS, and INT14 for sharing modems across LANs.

Overall, *Mk. 4* racked up relatively high scores on our performance tests, generally clocking in high in the second speed tier. On our Proprietary Protocol tests, its Dart protocol easily bested the competition.

Like the two other *Crosstalk* products reviewed here, *Mk. 4* comes with excellent documentation from DCA. The CASL reference, user guide, and connection options reference all add to the overall success of the package. DCA also offers free product support at a toll number, which operates from 8:30 A.M. to 8:00 P.M. (E.S.T.). If you are a *Crosstalk XVI* fan but want to move up to the power of *Mk. 4*, DCA makes the migration easy by allowing you to emulate *Crosstalk XVI* and avoid retraining.

Mk. 4 has proven itself time and again as a top-of-the-line communications package. From the long list of terminal emulations to the on-line context-sensitive help, and from its exemplary speed to its friendly user interface, DCA's *Crosstalk Mk. 4* shines.



Crosstalk Mk. 4 displays nearly the same status screen as *Crosstalk*

Communicator while dialing a phone number. However, it is a much more powerful program. With its 21 terminal emulations and extensive script language, *Mk. 4* is for the power user.

DynaComm Asynchronous Edition, Version 3.00.08

by Sara Parker

A powerful *Windows*-based communications product, *DynaComm Asynchronous Edition* can help you do everything from logging onto a BBS to emulating a 3270 terminal to accessing a network modem. You'll find the learning curve and the price a little steeper than for other *Windows* products reviewed in this roundup,

SUITABILITY TO TASK				
DynaComm Asynchronous Edition				
Mini and mainframe connections	☐	☐	☐	☐
Automated information retrieval	☐	☐	☐	☐
Systems and calls management	☐	☐	☐	☐

but if you need a robust script language, *DynaComm* could be for you. The package, from Future Soft Engineering, sells for \$295 and comes with a separate manual explaining how to use the program with *HP NewWave*.

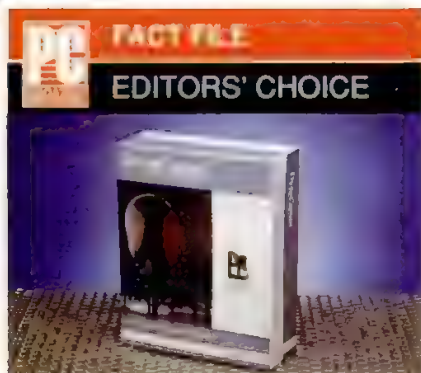
Future Soft has been shipping *DynaComm* since *Microsoft Windows 2.0* was current. The Terminal program included with *Windows 3.0* is actually a subset of *DynaComm Asynchronous Edition*. Another product, *DynaComm Elite*, allows you to emulate multiple mainframe sessions within a single window.

DynaComm includes DDE support and a long list of terminal emulations, along with a full script language that allows you to do things like creating dialog boxes and menus for your applications. Future Soft recently added ZModem to the product, and it sells synchronous, OS/2, and Macintosh versions as well.

Installation isn't complicated, but because of *DynaComm*'s complex variety of features, you should run the tutorial first. Predefined modem set-up strings are limited; you get only four.

For when you need assistance, *DynaComm* displays a hard-to-miss help icon resembling a bright yellow yield sign with a question mark inside. All of *DynaComm*'s icons are well thought out and convey a good deal of information at a glance. This version adds not only context-sensitive help but also the ability to

COMMUNICATIONS ASYNCHRONOUS



DynaComm Asynchronous Edition, Version 3.00.08

Future Soft Engineering Inc., 1001 S. Dairy
Ashford, Houston, TX 77077; 713-496-9400.
List Price: \$295.

Requires: 512K RAM (640K recommended),
hard disk, Microsoft Windows 2.x or 3.0.
In Short: A powerful but costly Windows
communications package, *DynaComm*
includes many valuable features like access to
network modems and 3270 terminal
emulation, but they take time to master. The
versatile script language can create a variety
of applications, including games.

CIRCLE 547 ON READER SERVICE CARD

view GIF (Graphics Interchange Format)
and RLE (run length encoded) files.

NETWORK MODEM ACCESS

You can alter your session parameters by
selecting the appropriate menu options.
They let you set the transmission rate at
anywhere from 110 to 19,200 bits per
second, choose COM1 to COM4 or a
network modem connection, adjust the
word size, or disable parity checking or
carrier detect. The handshaking handles
software and hardware flow control to
send data faster to modems with data
compression abilities. Although *Wincomm*
offers interrupt 14h network support,
DynaComm is the only Windows commu-

nications program reviewed here that
offers Novell and NetBIOS support, too.

DynaComm supports 14 terminal
emulation types, including DEC VT52,
VT100, VT102, and VT220, as well as
ANSI, IBM 3101, and TTY. Support for
these common terminal standards assures
compatibility with virtually any commu-
nications service.

You use *DynaComm*'s Director icon to
start communications sessions. The Di-
rector includes preconfigured log-on
scripts to services like AT&T Mail, BIX,
CompuServe, GENie, and MCI Mail, to
name a few. You can use or modify these
sample scripts; they prove helpful in
learning *DynaComm*'s robust and com-
plex script language. *DynaComm* has its
own editor, which remains active when an
edit window containing a script is in fo-
cus. The language lets you customize
communications completely, controlling
host sessions between PCs, or between
PCs and 3270 mainframes. The scripting
goes well beyond communications and
allows you to create Windows-based utili-
ties and games.

FILE-TRANSFER ABILITIES

DynaComm makes your file transfers
simple, supporting ASCII, CompuServe
B Plus, Kermit, XModem, YModem-
batch, YTerm, and ZModem protocols.
But it does not have the automatic down-
load/upload feature for ZModem, which
means that you have to take a little extra
time to select ZModem from the menu.

The file-transfer menu window shows
the transmission rate, estimated time for
completion, retry count, and a small

graphics representation of file-transfer
progress. *DynaComm* naturally can per-
form file transfers in the background,
toggling the appropriate icon's color to
indicate when it completes the transfer.
But compared with competing products,
DynaComm lacks the full potential of
Windows' graphical interface. Future Soft
should look to *Unicom* as a good example
of how to represent file transfers graphi-
cally.

At 19.2 Kbps, *DynaComm*'s perfor-
mance on our tests was parallel to that of
the other Windows-based systems. The
company provides excellent documenta-
tion, including a user guide, script refer-
ence, and material describing the inter-
face differences between the HP NewWave
and Windows versions of *DynaComm*.
Future Soft also supplies free technical
support for registered *DynaComm* users
at a toll number.

DynaComm Asynchronous Edition
provides powerful scripting and network
capability. If that's what you need, you
may want to check out *DynaComm*.

HyperAccess/5, Version 1.2

by Sara Parker

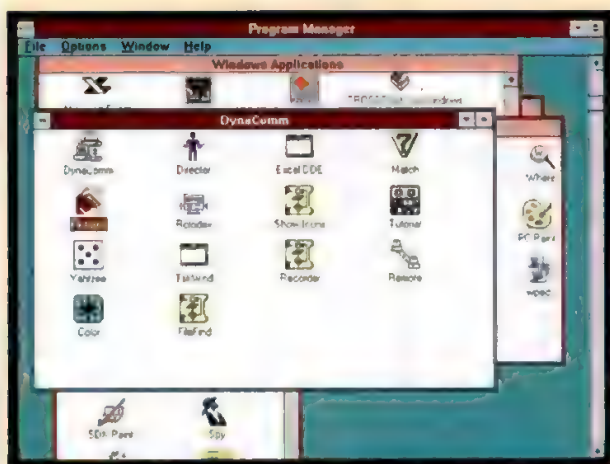
At only \$199, Hilgraeve's *HyperAccess/5*,
Version 1.2, provides features for both
DOS and OS/2, Version 1.2, users that
rival the most expensive comm programs.
If you buy the DOS version alone, it costs
\$99.95. Hilgraeve provided us with the
DOS and OS/2 version for our review,
although we ran our tests on it only in
DOS mode.

Because *HyperAccess/5* offers over 100
preprogrammed modem setup strings,
compatibility is seldom a question. The
package's ease of use makes running it a
pleasure. It includes a learning feature, a
virus scanner, a built-in editor, and the
proprietary HyperProtocol.

HyperAccess/5 installs automatically.
Terminal emulation types are numerous
and include popular models like DEC
VT52, VT100, VT220, and VT320, as
well as IBM 3101 and 3278, ANSI, and
TTY. After you answer a few simple
questions about your modem, you're ready
to communicate.

CALL FUNCTIONS

Calling a remote system is as easy as
selecting a couple of options from the



DynaComm Asynchronous Edition makes good
use of icons, which
convey much
information at a
glance. It also
includes a robust
script language and
preconfigured
log-on scripts for
services like
CompuServe and
GENie.

"Dow Jones helps me protect the assets of this vital multinational outfit."

—David Hess, Executive Director, Environmental Resources and Energy Committee, Pennsylvania Senate

David Hess works for the state.

But he also works for his neighbors, strangers and countless inhabitants of the animal kingdom.

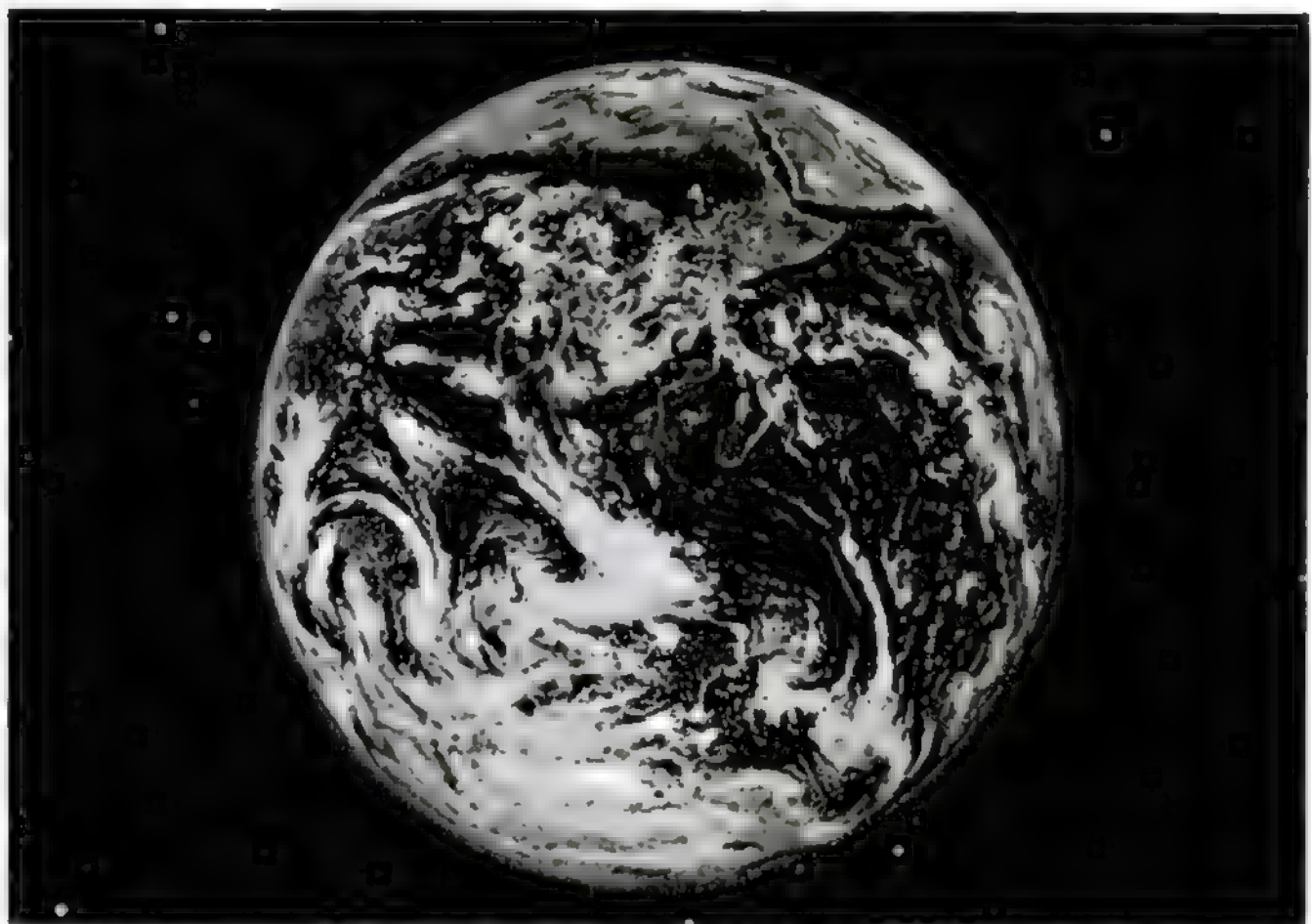
Because David Hess helps develop environmental legislation for the state of Pennsylvania.

And he's discovered a significant way to help protect the world's limited resources. He simply taps into the practically unlimited resources of Dow Jones News/Retrieval.

Within seconds of his request, a world of comprehensive, timely and accurate information makes its way to his computer. And suddenly David Hess knows how communities next door and thousands of miles away approach the same problems.

If wetlands legislation is enacted anywhere in the country, one of the many local and regional newspapers will have the story. If a fast food company announces a new recycling plan, the news is on the screen within seconds of its release.

Also making his job easier are hundreds of other rich information sources, including the complete text of *The Wall Street Journal* and full coverage of all the Dow Jones Newswires.



As Hess says, "Before, I had to pore through the library, call each state over and over again. Or worse, not have the information at all. I can't emphasize enough how much time I save by using News/Retrieval for everything I do."

A savings that's reflected on the profit/loss statement of the one enterprise we all belong to.

**DOW JONES
NEWS/RETRIEVAL®**
The lifeblood of business.™
Another Service from Dow Jones Information Services

For more details, call 1-800-522-3567, Ext 722. In N.J., call 1-609-520-8349, Ext 722.

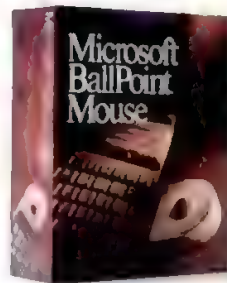
Dow Jones News/Retrieval is a registered service mark and The Wall Street Journal is a registered trademark of Dow Jones & Company, Inc. © 1990 Dow Jones & Company, Inc. All Rights Reserved.

We've launch solve proble



The new Microsoft® BallPoint® mouse represents one giant step for you and your laptop computer.

That's because new BallPoint is the first and only mouse specifically developed for laptops. It's compact, yet includes all the features that made the



ed a mouse to ms in space.



Microsoft Mouse the industry leader.

Simply attach it to either side of virtually any laptop keyboard, and adjust it to the most comfortable angle. Then thumb your way through Microsoft Windows[®] graphical environment version 3.0 and all your favorite mouse-driven applications.

And for a limited time, you can get a free BallPoint mouse when you purchase a

COMPAQ notebook or laptop PC.

Just call (800) 541-1261, and ask for Dept. P43. They'll send you everything you need to know about the mouse designed to go where no mouse has gone before.

Anywhere.

Microsoft
Making it all make sense[®]

COMMUNICATIONS ASYNCHRONOUS



HyperAccess/5, Version 1.2

Hilgraeve Inc., Genesis Centre, 111 Conant Ave., Suite A, Monroe, MI 48161; 800-826-2760, 313-243-0576.

List Price: \$199; DOS-only version, \$99.95.

Requires: 350K RAM; DOS 2.0 or later or OS/2 1.0 or later.

In Short: *HyperAccess/5* combines extensive modem support with a powerful script language. Add the virus detection capability and learn feature, and except for its slow ZModem File Transfer results, it's a sure bet for the price.

CIRCLE 548 ON READER SERVICE CARD

main menu and choosing the system you want to connect with. The package includes a convenient automatic redial feature for busy numbers and a call log that automatically keeps a record of your calls. You can set up a dialing queue so that if you reach a busy number, *HyperAccess/5* will go on to the next number. The program also lets you set up a Rolodex of up to 250 systems.

With *HyperAccess*, you can peruse incoming information as it comes onto the screen, direct it to your printer, or save it to disk. You can also store information in a RAM buffer and scroll through it while printing certain portions of the text or sending them to disk. (The buffer is normally 25 pages in length, but you can

increase it to 250K if you so desire).

You can set the program to dial in at rates ranging up to 115.2 Kbps. The program offers a wide variety of protocols, including ASCII, CompuServe B, CompuServe Quick-B, HyperProtocol, Kermit, XModem (checksum and CRC), XModem 1K, YModem-batch, YModem-G, and ZModem. HyperProtocol is *HyperAccess/5*'s proprietary protocol, and can be added as an external protocol to other communications programs.

HyperAccess/5 traces file-transfer progress by displaying a bar graph that shows the percentage of the file sent. When sending multiple files, a second bar graph shows the total sent. *HyperAccess/5* even keeps track of files that have been transferred.

EASY ACCESS TO EDITOR

HyperAccess/5's built-in editor is easy to use and lets you edit information you are holding in the review buffer, scripts you are writing or modifying, or files you are planning to transfer. If you would still rather use your own editor, that's okay with Hilgraeve too. *HyperAccess/5* allows you to access it from within the program.

HyperAccess/5 has its own powerful script language. You can assign a script to a specific key and run it from anywhere in the program. Or you can type HA5DOS followed by the script name at the DOS prompt to run the script as you are starting up *HyperAccess/5* if, for example, you want to log on to a service like MCI Mail directly from a batch file and scan your mailbox.

The learn feature in *HyperAccess/5* intelligently and accurately remembers keystrokes to automate repetitive processes and build scripts for you. *HyperAccess/5* doesn't ship with canned log-on scripts for specific services like CompuServe or MCI Mail. Hilgraeve's philosophy is that the learn feature builds these scripts more effectively.

Last but not least, Hilgraeve thoughtfully gives you a way to protect against viruses. By incorporating IBM's virus-scanning signatures, *HyperAccess/5* automatically checks incoming data during modem transmission for any sign of a virus. If it detects one, it interrupts the transmission and alerts the user.

When we ran our performance tests with *HyperAccess/5* at 115.2 kilobits per second, the program had to resend many packets due to error conditions. This resulted in the program having the slowest ZModem transfer time of any package operating at this speed on both the Character-based ZModem and Professional YAM tests.

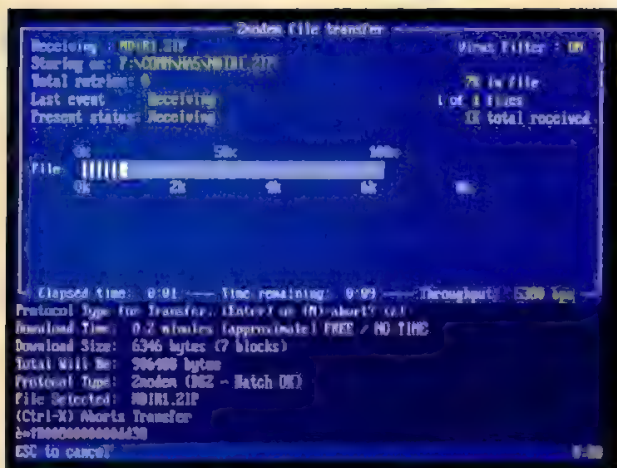
SUITABILITY TO TASK

HyperAccess/5

Mini and mainframe connections	☒	☒	☒	☒
Automated information retrieval	☒	☒	☒	☒
Systems and calls management	☒	☒	☒	☒

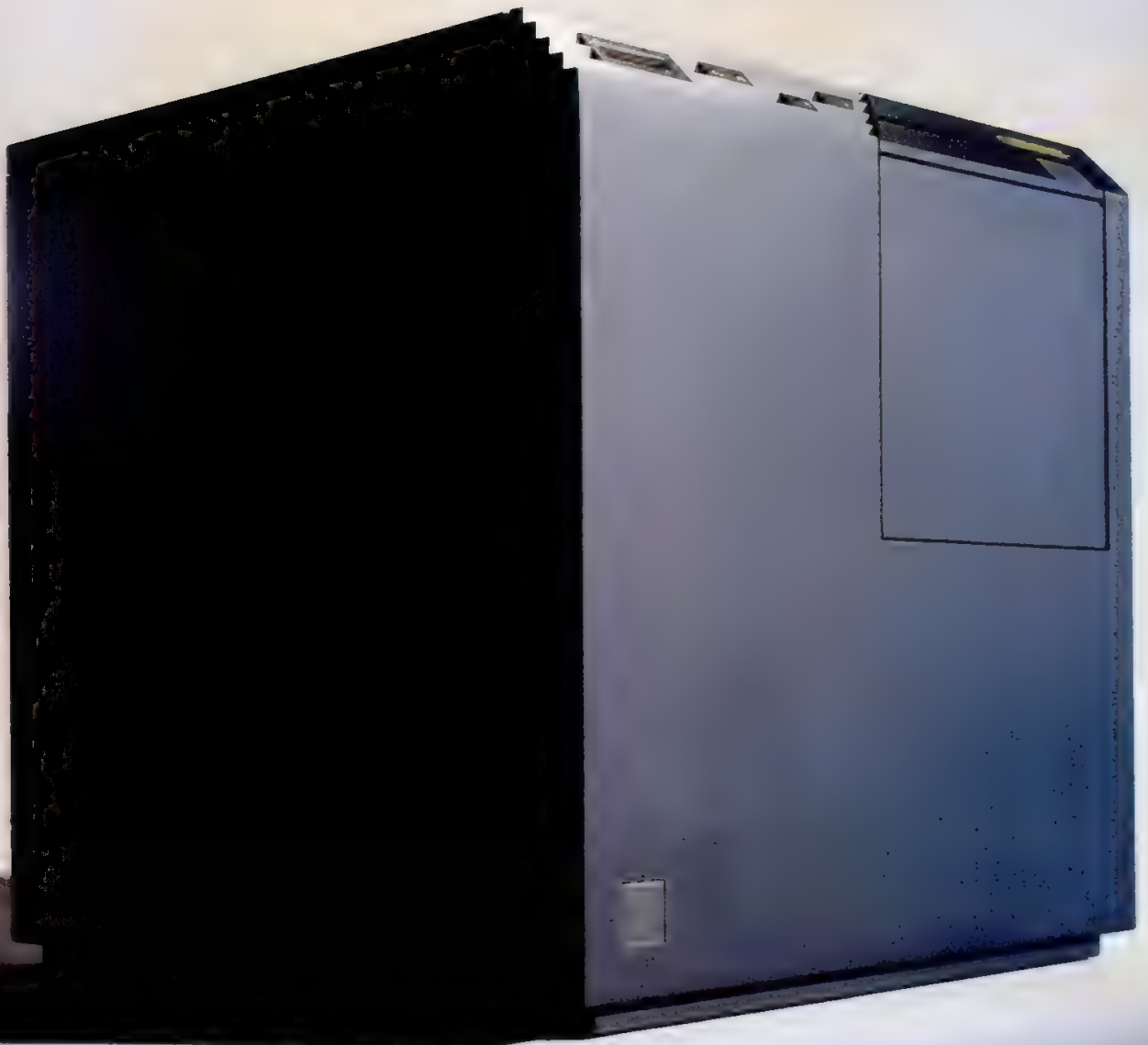
The proprietary HyperProtocol contained in *HyperAccess/5* gave excellent throughput, much better than its ZModem test scores. This is a valuable feature for PC-to-PC file transfers where both sides run *HyperAccess/5*, but at this time it unfortunately isn't valuable for communicating with bulletin board systems that tend to rely on ZModem. Hilgraeve is working to make HyperProtocol more widely accepted on bulletin boards and other public access systems by distributing its external protocol version of HyperProtocol freely.

HyperAccess/5 provides speed (via its proprietary protocol), accuracy, versatility, and reliability, with well-written documentation on both a basic and advanced level. Hilgraeve offers free technical support for *HyperAccess/5* during normal business hours, along with 24-hour BBS support. This product gives DOS and OS/2 users a way to communicate that is easy to learn and nearly unbeatable for the price.



HyperAccess/5's display of ZModem file-transfer progress manages to combine in a single bar graph the number of kilobytes and the percentage completed. The program lets you turn on a filter during the transfer to screen the received file for viruses.

This is what the
world's most powerful 486
system looks like.



Cylindrical pin and tumbler locks keep unauthorized fingers out of the hardware. (And your data is equally safe, because we've built password protection into the firmware.)

ETMS," Everex Thermal Management System, makes this the first system to solve the high temperature and related reliability problems of current and future processors. A partition separates the cube into two compartments, independently cooled by SmartFans." One contains the CPU, one the drives. Baffles funnel cool air where it's most needed. Even the power supply is cool, because at 400 watts, it runs at a fraction of its capacity.

Removable motherboard for instant upgrades, which we'll bring you as new technologies emerge.

All the full-length expansion slots you'll ever need—12 altogether, including 10 EISA slots.

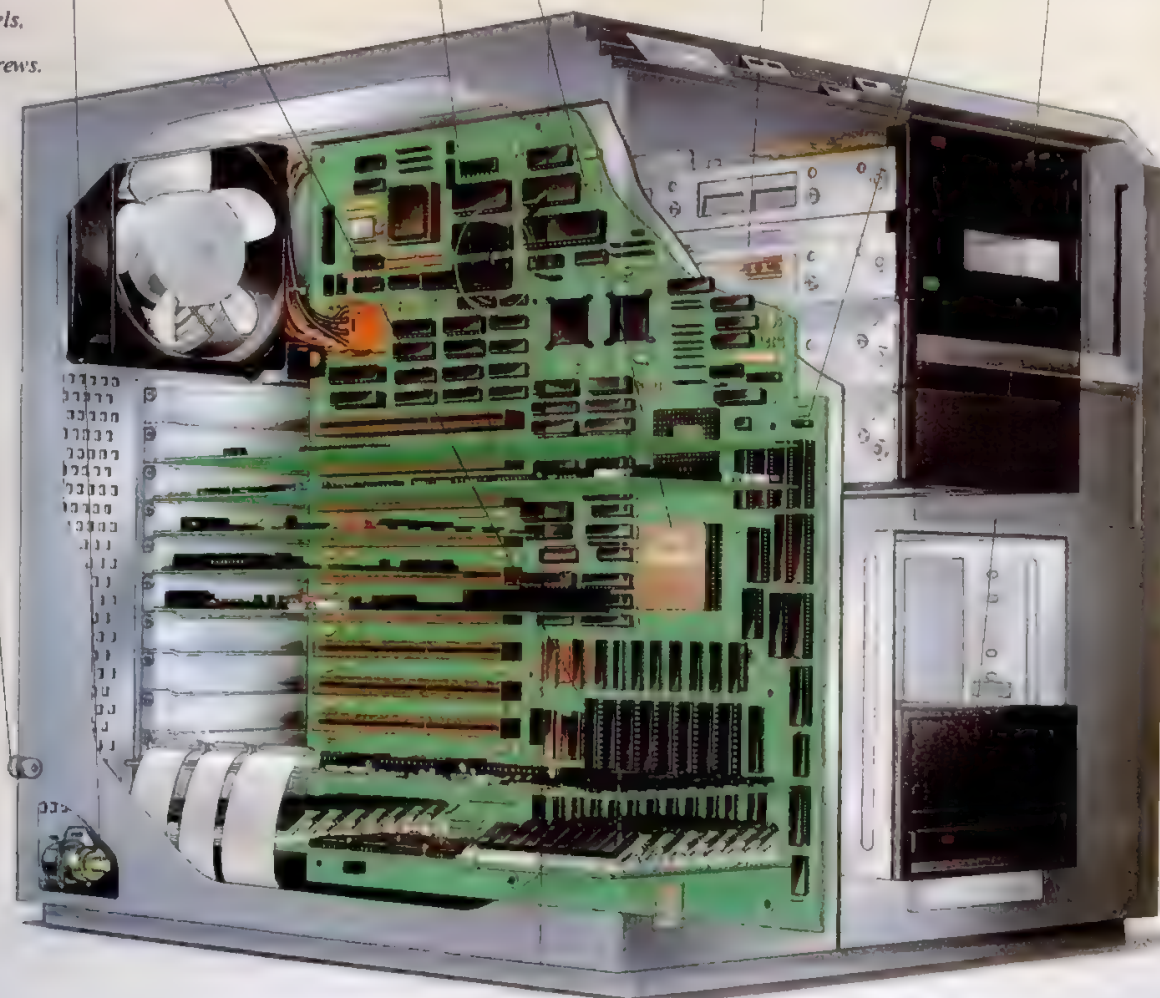
AMMA, a 256KB write-back caching architecture, forming "two-tier" caching in combination with the 486 chip's 8KB internal cache. It improves the cache hit ratio from 90% to as much as 99%.

Space for four quick release, half-height drives. They're front accessible, behind a hydraulically dampened door—which makes sure your drive heads are reading disks and tapes, not dust, smoke and humidity.

The 486/33 CPU chip, Intel's hottest. But when hotter chips come around, the cube will be cool enough to handle them. And that includes multiprocessors.

Quick release drive bays accommodate up to eight more drives that can be swapped out in less than five minutes.

The entire interior of the cube is accessible in seconds through side panels, using thumbscrews.



And this is why.

Conventional system design can't cope anymore. The emerging technology is just too hot for it.

Enter the STEP Megacube™. Redesigned from the ground up, the STEP Megacube is a 486™ system unlike any other. It incorporates ideas from the mainframe world, such as its caching architecture and thermal management. And it has performance and features that make it a perfect fileserver. Or a perfect multiuser system. Or a perfect graphics workstation.

A 486/33 CPU combined with Everex's proprietary Advanced Memory Management Architecture (AMMA™) gives it warp speed—21.7 MIPS. Space for twelve drives gives it storage that will remind you of the Library of Congress. And twelve expansion slots give it more expandability than you can shake a peripheral at.

And if it happens to be an Everex™ peripheral, you could get a nice performance bonus. Because Everex graphics, networking and controller boards are designed to take full advantage of our STEP™ architecture for even better performance.

Combine all this with up to 64 MB of RAM—enough for the most demanding applications—and you wind up with a computer that can be configured for anything.

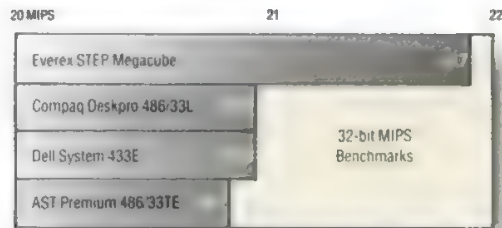
Even the future.

You see, the design breakthroughs of

the STEP Megacube eliminate the upgradability problems inherent in other systems. Which means that when the next generation processors arrive—like the 50 MHz 486, just down the road—all you have to do is swap out motherboards. No space problems. No overheating problems.

No obsolescence.

Performance-wise, this is a machine that will be hot long after others are cold and buried. In fact, as of now, there's no end in sight to the STEP Megacube's upgradability path.



But really, that shouldn't be much of a surprise. After all, at Everex, our mandate is "Always innovate, never compromise." And that's exactly the approach we took when we built the STEP Megacube.

Granted it doesn't look like your typical 486 system. Fortunately, it doesn't perform like one either. To find out more about what it can do, give us a call.

For a free copy of the STEP Megacube Application Guide, call:

1-800-258-STEP*

Introducing the STEP Megacube.



CIRCLE 113 ON READER SERVICE CARD

*Regulation from outside the U.S. call 415-498-1111. In Canada, 1-800-463-5161. Government Services Administration #C206K90AD5253 EVEREX for EXcellence is a registered trademark and Everex, STEP, Megacube, ETMS and AMMA are trademarks of Everex Systems. 486 is a trademark of Intel Corp. SmartPan is a trademark of NMB Technologies, Inc. Benchmark results from Intelligent Devices Corporation's HighTest Benchmarking Software. For more information on how they were derived, write the Everex Performance Test Center, 48431 Melmont Dr., Fremont, CA 94538 © 1991 Everex Systems, Inc.

Mirror III, Version 2.0

by Mike Byrd

The \$149 price of *Mirror III*, Version 2.0, gets you a program offering user-friendly interaction via pull-down menus, MNP error control and data compression, and an extremely powerful script language. All these combine to give *Mirror III* the flexibility to perform almost any communications session with ease.

Mirror's installation is a snap. In less than 8 minutes, we set up the program and connected with CompuServe. The installation menus help you configure *Mirror*

COMMUNICATIONS ASYNCHRONOUS

III to match your hardware, set up the telephone directory, and automate logging on to on-line services like CompuServe, Delphi, and Dow Jones News/Retrieval. The hardware setup menus provide a selection of 50 modem manufactur-

ers, with a second window displaying each manufacturer's models. Once installed, the program uses over a megabyte of disk space.

Mirror includes many popular terminal emulation modes, including ADDS Viewpoint, ANSI, Data General, DEC, Honeywell, IBM 3101, Lear Siegler, Televideo, Texas Instruments, Tymnet, Wang, Wyse, and Z-29.

The program is easy to operate. You can activate its pull-down menus using a Microsoft-compatible mouse or the Esc key. You can initiate the learning feature to record your keystrokes and build a script. Context-sensitive help is available for most selections.



PERFORMANCE TESTS: ASYNCHRONOUS COMMUNICATIONS SOFTWARE

While the speed of the modem will usually limit the throughput you get from any communications package, these direct connection tests show that there are significant differences among non-Windows-based products in terms of throughput and efficiency. Windows-based communications packages, however, show few speed differences when compared with one another.

For the **Character-based ZModem** tests, a 50K compressible file is moved from the 386 PC to the 286 PC over an RS-232C cable using RTS/CTS flow control. Both PCs use the same communications software and the ZModem file-transfer utility it contains.

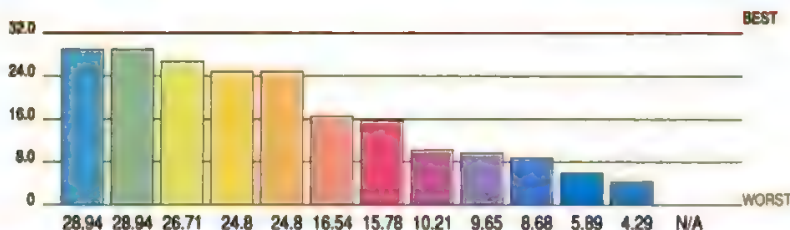
For the **Professional YAM** tests, a 50K compressible file is moved from the 386 PC to the 286 PC over an RS-232C cable using RTS/CTS flow control. The character-based communications program is installed on the slower PC, while the faster machine runs *Professional YAM*.

For the **Windows-based ZModem** tests, a 50K compressible file is moved between two 386-based PCs over an RS-232C cable using RTS/CTS flow control. Both PCs use the same communications software and the ZModem file-transfer utility it contains. Because all the programs we tested achieved similar results, we are not graphing the results of these tests.

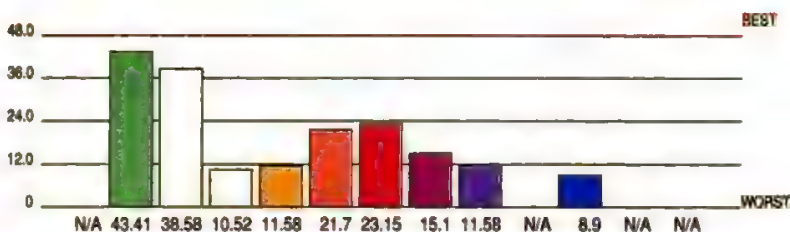
For the **Proprietary Protocol** tests, a 50K compressible file is moved from the 386 PC to the 286 PC over an RS-232C cable using RTS/CTS flow control. The transfer is controlled by whatever proprietary file-transfer protocol is available in the software. Because only four programs included proprietary protocols we are not graphing the results of these tests.

FILE-TRANSFER TESTS

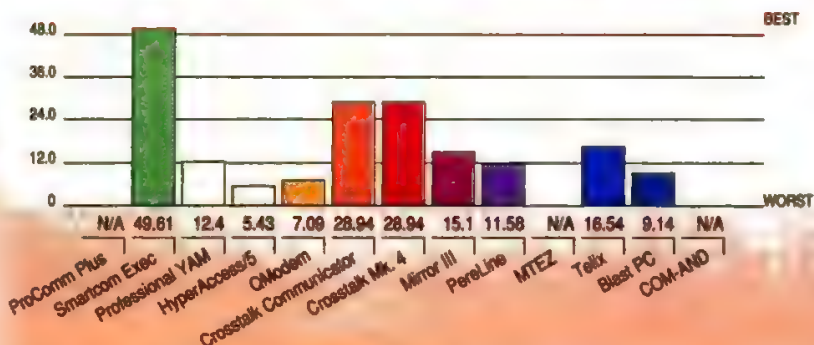
Character-based ZModem (38.4 Kbps) Throughput (kilobits per second)



Character-based ZModem (57.5 Kbps) Throughput (kilobits per second)



Character-based ZModem (115.2 Kbps) Throughput (kilobits per second)



N/A—Not applicable: The package did not complete this test.

Mirror III features a powerful dialing directory and a full-screen editor.



ADVANCED FEATURES

Along with mouse support, *Mirror III* incorporates many advanced features: background operation, a powerful dialing directory, and a full-screen editor. Full *Crosstalk XVI* compatibility allows

Crosstalk XVI users to keep their familiar commands and scripts.

You can put *Mirror* into background mode by pressing both Shift keys simultaneously. With access to the DOS command line, you can run a DOS operation or, with enough memory, another application. Pressing the Shift keys again switches you back to *Mirror*. A typical configuration uses 470K of RAM and leaves scant room for anything but DOS commands, but the manual suggests ways to reduce program size to 185K. *Mirror* also lets you issue several DOS-like commands from inside the program.

HOW WE TESTED

We tested the character-based communications packages using a fast PC and a much slower PC across a high-speed RS-232C link. One of the PCs was an ALR FlexNode with a 25-MHz 80386 processor; the other, an IBM PC AT with an 8-MHz 80286 processor. Both had serial ports using 16550A UARTs. We linked the two machines with an RS-232C null-modem cable to eliminate the throughput bottleneck caused by modems. We used RTS/CTS hardware flow control—which is typically used with high-speed modems—to regulate the data flow.

For maximum throughput, the faster machine moved the test file to the slower one from a RAM disk; we used the internal hard disk on the receiving AT to measure software efficiency. Thus, the throughput of the slower machine was a direct reflection of the efficiency and data-handling capabilities of the software.

For the Microsoft Windows-based products (*Crosstalk for Windows*, *DynaComm Asynchronous Edition*, *Unicom*, and *WinComm*), we ran tests on two 80386 computers, the ALR FlexNode and a Unisys PW² with an 80386 processor running at 33 MHz. The Unisys also had a serial port with the 16550A UART. In all likelihood, few users run Windows on anything less than a 386-class machine, and testing the Windows-based communications programs with an AT on one end would only have proven that Windows 3.0 grinds on slower machines.

For the character-based programs, we ran file-transfer tests at port speeds of 38.4, 57.6, and 115.2 kilobits per second. Not every product offers all those speeds, however. Therefore, we are not reporting as many scores for *BLAST PC* (which, oddly enough, supports the lower and higher transfer rates, but not a 57.6-Kbps transfer rate) and *MTEZ* (which does not support transfers at 57.6 Kbps or 115.2 Kbps). Three of the four Windows-based products are limited by the top speed of the Windows communications driver—19.2 Kbps.

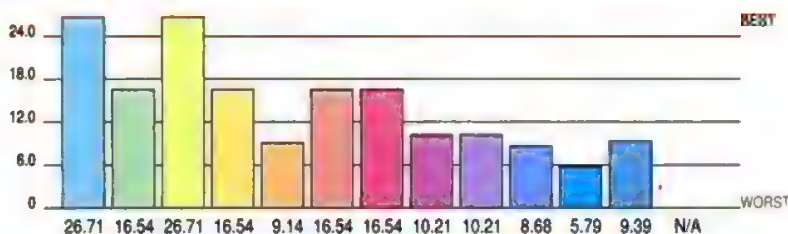
One group of file-transfer tests involves moving data between each product and *Professional YAM* (which we also review here). We chose *Professional YAM* because it is the standard for ZModem transfer protocols (Omen Technology, its developer, also developed the ZModem file-transfer protocol). These tests allowed us to evaluate the ZModem implementation in each product against this standard. We are reporting the results only for the character-based products; the Windows-based products all turned in the same times as on the Windows-based ZModem product-to-product tests.

We ran each test three times, clocked the running times with a stopwatch, averaged the results, and converted each average time to throughput measured in kilobits per second. In every instance, the elapsed time used to generate each throughput score was measured from the keystroke initiating the transfer to the moment the receiving software indicated completion.

CONTINUES

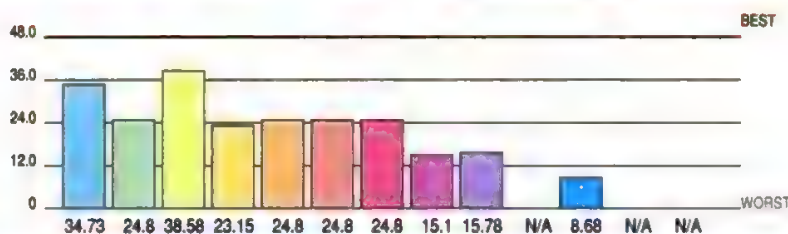
Professional YAM (38.4 Kbps)

Throughput (kilobits per second)



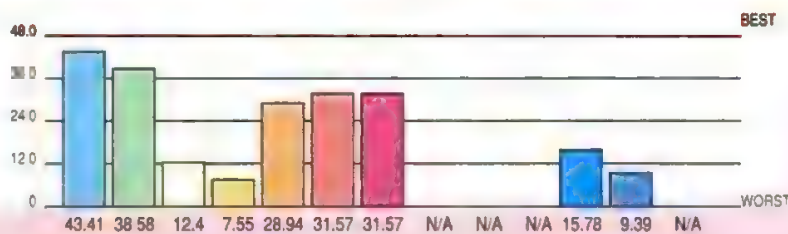
Professional YAM (57.6 Kbps)

Throughput (kilobits per second)



Professional YAM (115.2 Kbps)

Throughput (kilobits per second)



N/A—Not applicable: The package did not complete this test.

COMMUNICATIONS ASYNCHRONOUS

The dialing directory allows you to search entries for strings, add comments, or dial a chain of phone numbers. *Mirror* steps you through each option for building or revising directories. *Mirror's* built-in text editor uses *WordStar*-like commands to create and modify files from disk or your capture buffer. It supports search-and-replace and block operations, line centering, and word wrap.

FILE-TRANSFER CAPABILITIES

Among *Mirror's* major strengths are its file-transfer capabilities. For modem-to-modem negotiations, the program includes MNP (Microcom Networking Protocol) levels 2, 4, and 5, and ACT (Adaptive Computer Technologies) error control and data compression protocols. Even if your modem doesn't include these protocols, you can conduct error-free sessions with another MNP- or ACT-capable system. SoftKlone licenses its MNP add-on module from MagicSoft.

Mirror includes many file-transfer protocols, such as ASCII, CompuServe B, Crosstalk, Hayes, Kermit, Kermit Server, XModem, XModem 1K, and YModem-G. ZModem is an external protocol that uses Omen Technology's DSZ.COM program, but you select it from within *Mirror* the same way you choose the other protocols. The program also provides a file-overwrite safety feature and a superb-looking pop-up display of file-transfer status.



Mirror III, Version 2.0

SoftKlone, 327 Office Plaza Dr., #100, Tallahassee, FL 32301; 800-634-8670, 904-878-8564.

List Price: \$149.

Requires: 470K RAM (configurable to 185K), DOS 2.0 or later. Hard disk recommended.

In Short: *Mirror III* offers a user-friendly communications package with the power to converse effectively with BBSs, mainframes, and on-line services. Its strong menu functions provide flexibility for all operations, and it can add MNP error control and data compression standards to your modem.

CIRCLE 849 ON READER SERVICE CARD

With an auto-answer modem, *Mirror* allows you to run the program in host mode so you can dial in and perform remote operations, or let other users connect to your computer. A password feature controls access to your files by assigning each caller a security level. If your modem supports call-progress monitoring, *Mirror* can detect busy signals, lack of a dial tone, or a voice answer and adjust the modem's speed and protocol to other modems. The transaction log lets you keep a record of all commands and whether they came from the local keyboard, a remote system, or a script. The chat mode

displays user messages in split-screen local and remote windows. *Mirror's* protect feature secures your scripts from being viewed or modified by others.

A FEW GLITCHES

Overall, *Mirror's* operations work well, but we did encounter a few glitches. A couple of times when we tried different operations, the modem connected but the program timed out prior to establishing a handshake with the BBS. *Mirror* didn't provide adequate real-time error messages to help us, but the documentation enabled us to correct the situation.

In our performance tests, we found that the DSZ module used to provide *Mirror's*



PERFORMANCE TESTS: ASYNCHRONOUS COMMUNICATIONS SOFTWARE

There is not much to say regarding the Windows-based programs; *Crosstalk for Windows*, *DynaComm Asynchronous Edition*, and *WinComm* all achieved a throughput of 13.89 kilobits per second when data was transmitted at 19.2 Kbps. *Unicom*, with a speed of 12.4 Kbps, lagged behind only a little. Because of these very minor speed differences, we are not graphing the results of the Windows-based ZModem tests. The 19.2-Kbps limitation of the Windows communications driver helps to explain the parallelism of these results.

WinComm can bypass Windows' communications driver and directly set up the UART for speeds higher than that driver supports. But when we moved it beyond the 19.2-Kbps rate the Windows communications driver supports, the receiving computer encountered so many errors and made so many retries that the throughput settled at a sluggish 7.8 Kbps regardless of port speed.

The performance of the character-based products varied greatly. We found that Hayes' *Smartcom Exec* offers one of the best combinations of reliability and performance. Its results generally outshone most of its older competitors.

Though it does not move as swiftly as *Smartcom Exec*, *Crosstalk Mk. 4* proved quite a good performer, generally scoring on the high side of the second-tier range in all categories. More important, the file-transfer protocols worked smoothly and consistently. There were no failures at any speeds, and the program always indicates the correct status of the file-transfer activity. *Crosstalk Communicator* also gets points for matching its higher-end sibling nearly score for score.

Professional YAM's scores on the Character-based ZModem tests naturally mirror its *Professional YAM* test scores. *Professional YAM* had the second-fastest file-transfer times at rates of 57.6 and 38.4

Kbps on the Character-based ZModem tests. At 115.2 Kbps, though, the program practically dropped out of the race; the ZModem file transfer generated so many errors and retries that the effective throughput fell sharply. When we turned off the CTS/RTS flow control protocols, the program had the fastest transfer time at 115.2 Kbps (we are not reporting the scores for that run of tests); handling the RS-232 flow control signals apparently inhibited the flow of data on the slower PC. Unfortunately for *Professional YAM*, the ability to use CTS/RTS flow control is necessary to make the most-efficient connections to high-speed modems.

COM-AND had a more significant problem handling a file transfer when hardware (CTS/RTS) flow control was implemented. The program failed all of our tests at the three port speeds we used. Like *Professional YAM*, with CTS/RTS turned off, it was one of the fastest at transferring files.

Products like *Mirror III* and *PereLine*, which incorporate their ZModem capabilities by way of the DSZ program, failed to complete the file transfer at 115.2 Kbps when working against *Professional YAM*. *Mirror III* worked fine at the highest transmission speed when we used the product on both PCs, as did *PereLine*, indicating that the problems were more with the compatibility of their file-transfer protocols than with data handling. Data-handling problems showed up in programs like *QModem* and *HyperAccess/5*, which, paradoxically, sometimes increased their throughput when we sent the files at slower data-signaling rates.

When we ran *HyperAccess/5* at 115.2 Kbps, the program had to resend many packets because of error conditions. This resulted in *HyperAccess/5's* having the slowest ZModem transfer time among all the packages operating at this speed.

ZModem operation would not operate at 115.2 Kbps on our Professional YAM tests, although the program shows the speed as an option on its menu. Operations proceeded smoothly (even at 115.2 Kbps), if not with the greatest speed, on the Character-based ZModem tests.

If you need help, technical support is free via toll number, fax, and BBS. You can leave messages to SoftKlone Technical Support in the SoftKlone section of the Zenith forum on CompuServe. *Mirror III* comes with a 60-day money-back guarantee.

Mirror's user-friendly look and feel belie its underlying power. Whether connecting to a mainframe, on-line service,

ProComm Plus failed to complete high-speed file transfers when the same product was running on two PCs, and yet it worked reliably with *Professional YAM*; in fact, it scored top marks on the Professional YAM tests. The ZModem implementation of *MTEZ* was the slowest overall. It could only perform at 38.4 Kbps, where its scores were very unimpressive.

We are not graphing the results of our Proprietary Protocol tests, as only four products included proprietary protocols: *Crosstalk Mk. 4* and *Crosstalk for Windows* used DART, *HyperAccess/5* used Hyperprotocol, and *BLAST PC* use the BLAST protocol. (The proprietary CrossTalk file-transfer protocol is included in *Crosstalk Mk. 4* and *Crosstalk for Windows* only to provide backward compatibility with *Crosstalk XVI*. We did not test the CrossTalk protocol, as DART is Digital Communications Associates' preferred proprietary protocol.)

Crosstalk Mk. 4 and *HyperAccess/5* gave throughput rates as high as the best ZModem implementation using their proprietary protocols, which benefited from the compressibility of the data file. *Crosstalk Mk. 4* achieved 31.57 kilobits per second when we tested at 38.4 Kbps, 43.41 at 57.6 Kbps, and 49.61 at 115.2 Kbps; *HyperAccess/5* scored 38.58 kilobits per second across the board. When we ran file-transfer tests using DCA's proprietary DART protocol in *Crosstalk for Windows* using an RS-232C signaling speed of 19.2 Kbps, we saw a low throughput rate of 8 kilobits per second. Our testing didn't show much to recommend *Blast PC's* ZModem implementation, and its proprietary protocol speeds couldn't touch *Crosstalk Mk. 4's* DART and *HyperAccess/5's* Hyperprotocol. It achieved scores of 20.43 kilobits per second on both the 38.4- and 115.2-Kbps tests using the BLAST protocol.

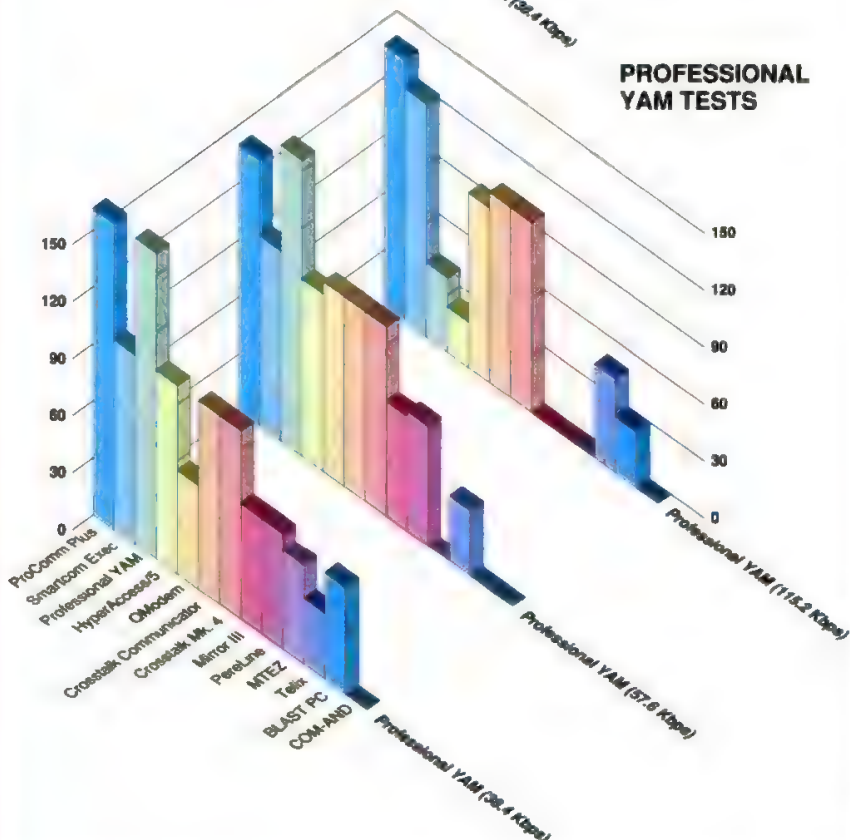
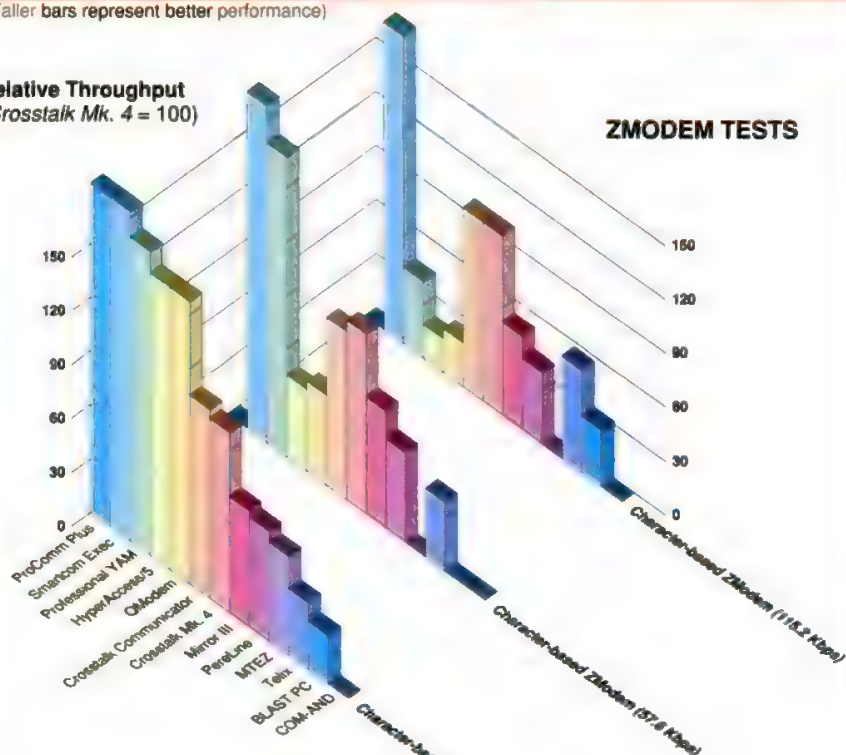
COMMUNICATIONS

ASYNCHRONOUS

FILE TRANSFER TESTS: COMPOSITE VIEW

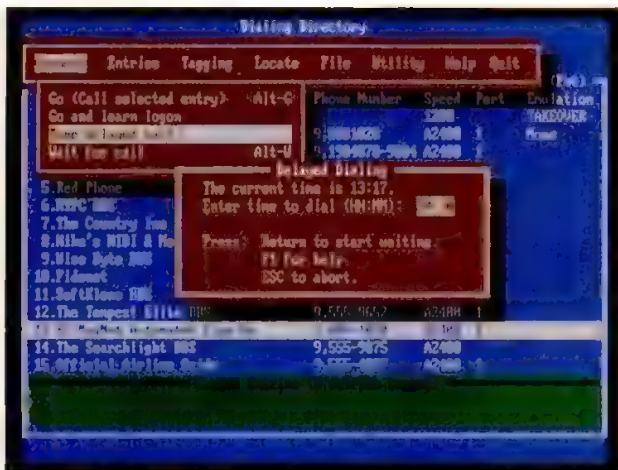
(Taller bars represent better performance)

Relative Throughput
(Crosstalk Mk. 4 = 100)



ENDS

COMMUNICATIONS ASYNCHRONOUS



You can use a mouse or the Esc key to select choices off of *Mirror III's* pull-down menus. This program permits delayed dialing, so that you can specify times for making unattended calls.

corporate headquarters, or BBS, *Mirror* does it all, and does it well.

MTEZ, Version 1.10 by Mike Byrd

MagicSoft's *MTEZ* offers a modular approach to assembling only the features you need for your system. For \$50, you get a basic communications program with lots of expansion capability. MagicSoft sells add-on modules to give you MNP error control and data compression, cellular communications, extra file-transfer protocols and terminal emulators, a script language, and fax capabilities. The *MTEZ* package we tested included the basic program, along with the MNP, Protocol and Emulation, and Script Add-On modules, for a total cost of \$129.

You can slim the program down to about 140K of disk space and still have up to 200 numbers in a phone directory. Each directory stores settings for eight possible dialing locations, letting you create configurations for any office or hotel room you call from. For each specific location, you can set modem initializations and dialing prefixes and suffixes; this lets you place local, long-distance, PBX, and credit-card calls, and access distant on-line services.

ADD-ON FEATURES

The basic *MTEZ* program gives you DEC VT102 terminal emulation along with ASCII, XModem, YModem-batch, and YModem-G file-transfer protocols. If your

modem already has Microcom Networking Protocol levels 2 to 5 built in, you don't need to purchase the MNP module add-on, priced at \$29. But if your modem lacks MNP, this module may save you money. MNP 5 can decrease file-transfer times by compressing data, while levels 2 to 4 detect errors when talking with another MNP-capable system. On noisy telephone lines, MNP also helps keep garbage characters off your screen.

The \$24 Protocol and Emulation Add-On module delivers a host of additional terminal emulations and file-transfer protocols. The terminals include ADDS ViewPoint, CompuServe Vldtex, Debug, DEC VT52, IBM 3101/3270, Televideo (912, 920, and 925), TI 931, Wang, and Wyse 50/60 emulations. The module offers a full-screen text editor and viewer; you can also substitute your own. The built-in editor contains basic editing func-

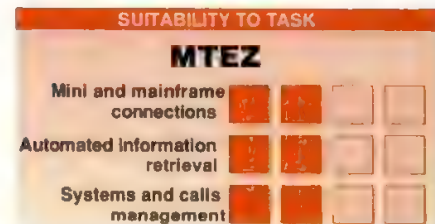
tions like deleting the current line, jumping to a specified line number, or searching for a string, but no formatting commands or block operations. Additional file-transfer protocols include ZModem and CompuServe B Plus, along with Kermit and Kermit Client.

The \$49 Script add-on brings script language capability to *MTEZ*. String and integer variables allow you to write loop controls and counters into your scripts. The add-on contains sample scripts for BIX, CompuServe, and MCI Mail. The only major omission is a script-language learning function.

MagicSoft seamlessly and transparently integrates these modules into the basic *MTEZ* system without requiring you to shell out to DOS to operate the add-on functions.

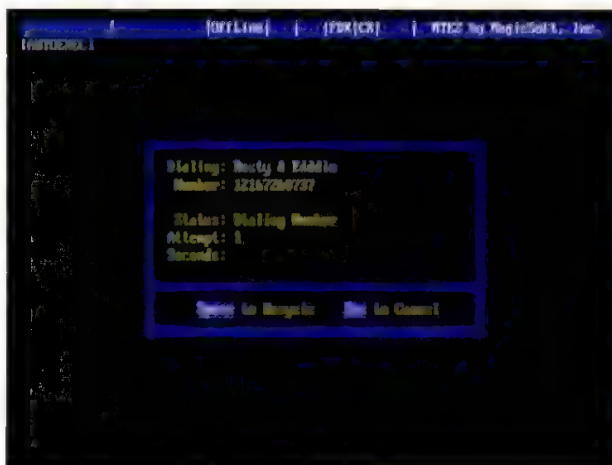
STRAIGHTFORWARD OPERATION

Using *MTEZ* is simple and speedy. An omnipresent help line remains at the top of your screen; context-sensitive help is also available. The pop-up Lotus-style



menus appear clear and concise; you can bypass the menus with Alt-key combinations.

MTEZ offers mouse support. You can also set up keyboard macros to automate commands. The program supports a mini-



MTEZ gives you a comparatively clean-looking screen while dialing a phone number. MagicSoft's basic and capable program works with a variety of useful add-ons.

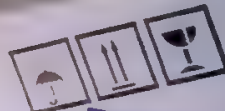
"A SWAN TAKES OFF"

The systems that PC Magazine
raves about can be shipped to
your home or office tomorrow



Introducing...

Swan Express



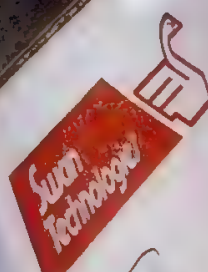
**IMMEDIATE
SHIPMENT**

386

Computer

Swan Computers

Swan Computers



**Prices Reduced on the
Best-Supported Systems
in the Industry!**

see next
page for details

Call Toll-Free 1-800-468-9044

Introducing...

Why wait 2 or 3 weeks for your new computer?
We will ship it today! **Guaranteed.** Take your pick
from our nine most popular configurations.

Swan

Swan 486/25

- 4MB of 32-bit RAM, expandable to 16MB
- 8K internal cache, 64K secondary cache
- 100MB IDE hard drive—17ms access
- 1.2MB 5.25" and 1.44MB 3.5" floppy drives
- DOS 4.01 Installed

NEW LOWER PRICE!

Complete 100MB Monochrome System

\$3495

Swan 386/33

- Intel 80386DX-33™
- 4MB of 32-bit RAM
- 64K of SRAM cache
- 200MB IDE hard drive
- Dual floppy drives
- Swan high-resolution (1024 x 768) video system
- DOS 4.01 installed

NEW LOWER PRICE!

Complete 200MB VGA Color System

\$3395

Swan-Express
configuration...available now!

386/33	VIDEO OPTIONS Include Monitor & Video Adapter			
	Mono	14" Flat Mono	VGA Mono	1024 VGA
w/100MB (17ms) IDE	\$2595	\$2645	\$2795	\$2995
w/200MB (16ms) IDE	\$3095	\$3145	\$3295	\$3395
w/330MB (16.5ms) SCSI	\$3695	\$3745	\$3895	\$4095
w/660MB (16.5ms) SCSI	\$4595	\$4645	\$4795	\$4995

Swan 386/25C

- Intel 80386DX-25™
- 4MB of 32-bit RAM expandable to 16MB
- 64K of SRAM cache
- 100MB IDE hard drive—17ms access
- 1.2MB 5.25" and 1.44MB 3.5" floppy drives
- Swan high-resolution (1024 x 768) video system
- DOS 4.01 installed

NEW LOWER PRICE!

Complete 100MB VGA Color System

\$2895*

S=D2A4

Read What The Industry Experts Have To Say About Swan...

"Swan earned top honors...these ratings mean that Swan managed to make and keep its users happier than any other PC manufacturer."
—PC Magazine, 9/11/90
Service & Reliability Survey



"Swan's 486/25...a great machine at a near mythical price. If someone offers a similar configuration for less, worry about the quality."
—Computer Shopper, 10/90

COMPUTER SHOPPER

"It is well constructed, very expandable, and one of the best 386SX performers we've seen...an exceptional value."
—Computer Buyer's Guide and Handbook

COMPUTER

"Swan's engineers clearly demonstrated that the time of building PC's with whatever parts are cheapest are over."
—Bill Machrone
PC Magazine, 9/11/90



"It's faster than other uncached machines I've tested...for the price, Swan's 386/25 offers some of the best performance you can buy."
—PC Sources, 11/90

PC Sources

"The Swan 386/33...a strong recommendation as an ideal home or small office machine."
—PC Magazine, 12/25/90



Swan 386/25

- Intel 80386DX-25™
Norton SI (v4.5): 26.3
- 1MB of 32-bit RAM expandable to 16MB
- 50MB IDE hard drive—17ms access
- 1.2MB 5.25" or 1.44MB 3.5" floppy drive
- High-resolution (720 x 348) mono video system

PRICES REDUCED!

Complete 50MB Monochrome System

\$1695

386/25	VIDEO OPTIONS Include Monitor & Video Adapter			
	Mono	14" Flat Mono	VGA Mono	1024 VGA
w/50MB (17ms) IDE	\$1695	\$1745	\$1895	\$2095
w/100MB (17ms) IDE	\$1945	\$1995	\$2145	\$2345
w/200MB (16ms) IDE	\$2445	\$2495	\$2645	\$2845

2MB Performance System

- 2MB RAM, 50MB (17ms) hard drive
- 1024 color VGA • Dual floppy drives
- DOS 4.01 and Windows 3.0 installed
- Swan mouse • Swan mousepad

\$2395

Swan-Express
configuration...available now!

4MB Power System

- 4MB RAM, 100MB (17ms) hard drive
- 1024 color VGA • Dual floppy drives
- DOS 4.01 and Windows 3.0 installed
- Swan mouse • Swan mousepad

\$2695

Swan-Express
configuration...available now!

Swan 286/12

- 80286 12/8 MHz
Norton SI 11.7
- 1MB of 16-bit RAM expandable to 8MB
- 40MB IDE hard drive with voice coil
- 1.2MB 5.25" floppy drive
- High-resolution VGA video system
- Small footprint case
- Utilities software
- Enhanced 101-key keyboard

NEW LOWER PRICE!

Complete 40MB VGA Color System

\$1495

Swan-Express
configuration...available now!

1-800-468-9044



Swan has done a nice job of balancing quality components, comprehensive support, and highly competitive pricing.
—PC Sources, 11/90

Swan 386SX

- Intel 80386SX-16™
Norton SI (v4.5): 17.3
- Novell Labs tested and approved
- 1MB of 16-bit RAM expandable to 8MB
- 50MB IDE hard drive—17 ms access
- 1.2MB 5.25" or 1.44MB 3.5" floppy drive
- High-resolution (720 x 348) mono video system

PRICES REDUCED!

Complete 50MB Monochrome System

\$1295

386SX/16	VIDEO OPTIONS Include Monitor & Video Adapter			
	Drive Options	Mono	14" Flat Mono	VGA Mono 1024 VGA
	w/50MB (17ms) IDE	\$1295	\$1345	\$1495
	w/100MB (17ms) IDE	\$1545	\$1595	\$1745
	w/200MB (16ms) IDE	\$2045	\$2095	\$2245

2MB Performance System

- 2MB RAM, 50MB (17ms) hard drive
- 1024 color VGA • Dual floppy drives
- DOS 4.01 and Windows 3.0 installed
- Swan mouse • Swan mousepad

\$2049

Swan Express
configuration...available now!

4MB Power System

- 4MB RAM, 100MB (17ms) hard drive
- 1024 color VGA • Dual floppy drives
- DOS 4.01 and Windows 3.0 installed
- Swan mouse • Swan mousepad

\$2395

Swan Express
configuration...available now!

Call for details on our 20MHz 386SX!

Swan XT10

- 10/4.77 MHz 8088-1
- 640K RAM
- 32MB hard drive—40ms access
- 360K floppy drive
- High-resolution (720 x 348) mono video system
- 150W Power Supply
- 640K RAM
- Enhanced 101-key keyboard
- Recipient of Computer Shopper's 1990 Best Buy award

Complete 32MB Monochrome System

\$925

S=D2A4



The systems marked with our Swan Express symbol



have been built, thoroughly tested, packed and are ready to be shipped to you today.

Swan Express Guarantee

If we are unable to ship your credit-approved order for one of the Swan Express configurations on the same day, we will pay the shipping fee.*

* Guarantee only applies to orders for one of the nine configurations listed while they remain in stock, credit-approved orders accepted weekdays prior to 3pm EST.



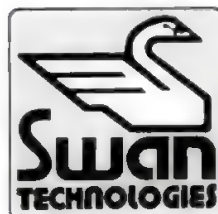
2-Year Warranty With Free On-Site Service

Don't settle for half the coverage. We understand the importance of keeping your computer up and running, not just for the first year, but long after. Our devotion to quality manufacturing plus years of experience have enabled us to double the warranty on all Swan 286, 386, and 486 systems. We use only the finest components from companies such as Quantum, Sony, Conner and Intel, which has substantially increased the reliability level of Swan systems. We are extending that confidence to you with a warranty that is twice as long as most computer companies offer.

The Swan 2-year warranty includes free field service, which is provided by TRW, with over 200 service centers nationwide.

"Acknowledging that mail-order customers are seeking improved service and support from every manufacturer, Swan Technologies is doubling the warranty and on-site service period on its PCs and monitors."

—PC Sources, 3/91



1-800-468-9044

Peripherals



Monitors

Swan VGA 15

Our professional multiscanning monitor features non-interlaced 1024 x 768 resolution and a 15" anti-glare screen. It accepts both analog and digital input. Other features include .31mm dot pitch, auto screen sizing and tilt/swivel base.

\$599

Swan 1024 VGA

\$399

Swan TTL Monochrome

\$89

Video Cards

New! Swan VGA Palette Plus

Delivers 32,763 colors from a palette of 16,700,000! With 1MB, the Palette Plus supports resolutions up to 1024 x 768 non-interlaced. Includes drivers for WordPerfect 5.1, AutoCAD, 8514/A, plus HiColor™ drivers for Windows 3.0.

\$249

Swan 1024 VGA Card

Superior clarity and fantastic colors of non-interlaced 1024 x 768 resolution.

w/ 1MB

\$199

w/ 512K

\$159

w/ 256K

\$129

New! Swan Spectrum VGA

This 16-bit card supports 640 x 480 resolution with 16 colors.

\$69

Modems

Swan 9600 Baud Modem

Ideal for high-volume, high-speed transmissions. Supports the v.42 standard for error-free communication.

\$429

2400 Bd MNP Int/Ext

\$99/\$129

2400 Bd Int/Ext

\$75/\$99

"I wave the Swan flag... these people are great when it comes to making things work for the customer."

Daniel Morgan
PC Magazine
9/25/90

Tape Backups

Swan 700MB Tape Backup

Fast, cost-effective high-capacity data storage, with data transfer rates of up to 12MB per minute. Features software data compression, Novell compatibility plus expanded memory support. Requires data compression card.

Internal/External **\$799/\$999**

Swan 250MB Tape Backup

Internal/External **\$319/\$419**

Swan 120MB Tape Backup

Internal/External **\$249/\$349**

Swan SendFAX

Now you can send faxes directly from your PC to any Group III compatible fax machine or PC Fax at 9600bps. The Hayes compatible modem communicates at 2400, 1200, and 300 bps. Includes BitCom software.

\$109

Swan Elite Keyboard

This keyboard offers 130 keys, built-in calculator, eight arrow keys and a turbo key.

\$99



Two year Warranty With Free On-site Service*

Don't settle for half the coverage. We understand the importance of keeping your computer up and running, not just for the first year, but long after. Field service is provided by TRW, a leader in computer maintenance, with over 200 service centers nationwide.

*additional mileage charges may apply



30-Day Money-Back Guarantee

If, for any reason, you're not satisfied with any Swan brand product, return it within 30 days for a refund.



QUICK On-Line Shopping

Swan OnLine™ is being extended to include product information and order taking capability.



Special Programs for Corporate & Education Customers

A special, dedicated sales team serves the unique needs of our growing base of corporate and education customers.

Swan Now On GSA Schedule

Government customers can call our government hotline 800-533-1131 toll-free for information on GSA approved pricing for Swan products.



Technical Support is Open Every Day

Our award winning Technical Support is now available every day, 365 days a year. Our Tech Support is open: Mon-Fri 9am to 9pm, Sat and Sun 9am to 5pm EST.



Direct Access to Tech Support

Just call 800-468-7926 toll free for direct connection to Swan's Tech Support Department.

Mon-Fri: 8am to 11pm
Sat: 10am to 8pm
Sun: 12pm to 8pm EST

Call For Your Free Catalog



No surcharge on credit card orders. • Your card is not charged until your order is shipped. • Software or accessories orders over \$100 and under \$150 will be shipped Federal Express. • Orders for in-stock items received before 3 pm EST will be shipped same day...and each order is insured at no cost to you! • 3% or \$5 minimum for UPS Ground. Call for shipping charges on Express Air, APO, FPO, AK, HI and all foreign orders. • If part of your order is backordered, the remainder will be shipped UPS Ground. • Allow 2 weeks for all checks to clear. • ALL SALES (except Swan products) ARE FINAL. Items returned must be as-new, without modification or damage. All warranty cards, manuals, and packaging material must be included. Return shipping must be pre-paid and insured, bearing an RA* on the shipping label. • Shipping and upgrade fees are non-refundable. • Defective items replaced or repaired at our discretion. • PA deliveries add 6% sales tax. • Prices & terms subject to change without notice. • Products may differ from photos. • TRW service available for continental U.S., Puerto Rico and Hawaii—additional mileage charges may apply.



3075 Research Drive
State College, PA 16801

S=02A4

CIRCLE 268 ON READER SERVICE CARD

1-800-468-9044

host mode with remote access capabilities to let you and other users dial in to your computer from outside. Security is minimal in the host mode, with a single password for logging in and a single password for shelling to DOS. Other communications programs have a unique password for each user.

MTEZ doesn't include the higher

throughput speeds of 115.2 and 57.6 Kbps found in competing programs. The highest port speed it offers is 38.4 Kbps. The ZModem implementation of *MTEZ* produced relatively slow throughput on our tests, and the file-transfer bar graph on the transmitting side oscillated between show-

ing 100 percent completion and the real completion status it obtained from the receiving side. This rapid change in the bar graph isn't a true operational problem, but it can be confusing to watch.

MTEZ comes bundled with a variety of laptops and with modems from AST, Cardinal, GVC, Intel, Rockwell, Toshiba, and Touchbase. Free technical support is

OBJECTTEL: Communicating the French Way

by Sara Parker

ObjectTel, a new communications product for the *Microsoft Windows 3.0* environment from the French Matesys Corp., was set to make its debut in the United States in February of this year. A final copy of the U.S. version was not available in time for us to include it in our review, but features not found in its American competition, such as support for a wider variety of word sizes and international modulation standards, make it worth an early look. The company plans to price the product at \$199.

In France, *ObjectTel* is known as *TwinTalk*; it has been on the market there for over a year. While *ObjectTel* will offer basically the same interface as its French counterpart, it will also include scripts for logging on to American on-line services such as CompuServe and MCI Mail.

A feature that's unique to *ObjectTel* is open network-driver architecture, which provides support not only for Novell NASI (*NetWare Asynchronous Services Interface*), but also for *LAN Manager/X* and Unix TCP/IP through the BAPI protocol.

ObjectTel's parameter settings include a 57.6-kilobit-per-second rate, even though the *Windows COMM.DRV* driver currently supports a rate of only 19.2 Kbps. *ObjectTel* includes its own device driver, but as with *WinComm* (which also bypasses *Windows'* communications driver), you should be careful about operating at these higher speeds. Any programmer who violates *Microsoft's* prescribed method of creating a *Windows* program runs the risk of making something that is incompatible with other *Windows*-compliant products. As with *WinComm*, since neither the *ObjectTel* driver nor the program activates the FIFO buffer on a 16550A UART,

ObjectTel makes good use of the *Windows* interface to show an informative pop-up display of file-transfer progress with a colored moving bar graph. The pop-up window leaves room for you to see the file-size and transfer-time information on the main screen.

and since the CPU may be busy with other *Windows* tasks, PCs on the receiving side of a fast stream of data may drop bits. This can lead to numerous retries and a lower throughput for the communications link.

ObjectTel's parameter settings include a choice of byte sizes ranging from 4 to 8 (most other products offer 7 or 8), one of four comm ports, handshake control, and lots of specific modems on the setup menus. Another interesting feature offers support for dialing modems, nondialing modems, direct-line RS-232 connections, and interrupt 14h dynamic link libraries.

Because of the stress placed in Europe on conforming with international standards, *ObjectTel* contains menus listing connection options for V.21, V.22, V.22bis, V.23, V.23bis, and V.32bis, although it lacks support for the V.42bis standard.

The program does resemble American-made communications packages in some respects, including the types of terminal emulations and file-transfer protocols it supports and its script-learning feature. *ObjectTel* does a decent job supporting multiple terminal-emulation



types, such as ANSI; CompuServe Vindex; DEC VT52, VT102, and VT220; IBM 3101; and TTY. File-transfer protocols include CompuServe B, Kermit, XModem, and ZModem. The program allows you to auto-start ZModem transfers for added convenience.

ObjectTel lets you monitor file-transfer progress by displaying the percentage completed along with a bar graph, while the program runs in the foreground or the background. The learning feature makes it easy to replay a log-on sequence and execute it automatically as a script.

Matesys says it will offer a toll-free technical support hot line for the product when it ships. That's just one more reason to keep an eye out for *ObjectTel*. It promises to become a serious contender in the *Windows* communications arena in the United States.

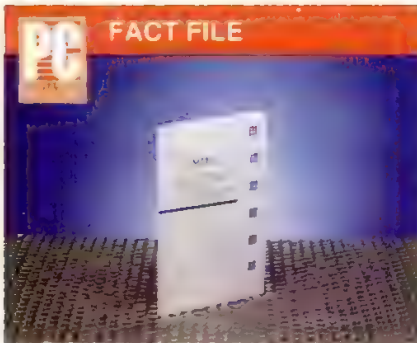
ObjectTel

Matesys Corp., 900 Larkspur Landing Circle, #175, Larkspur, CA 94939; 800-777-0545, 415-925-2900.

List Price: \$199.00. **Requires:** 640K RAM, hard disk, VGA monitor, *Microsoft Windows 3.0*.

CIRCLE 622 ON READER SERVICE CARD

COMMUNICATIONS ASYNCHRONOUS



MTEZ, Version 1.10

MagicSoft Inc., P.O. Box 396, Lombard, IL 60148; 708-953-2374.

List Price: \$50; with three modules, \$129; with cellular communications, \$149.

Requires: 256K RAM, DOS 1.0 or later.

In Short: MTEZ, with its package of add-on modules, offers straightforward, easy-to-operate connectivity with BBSs, mainframes, and on-line services. It's well suited for the traveling floppy disk-equipped laptop environment, but its slow operation is a drawback.

CIRCLE 888 ON READER SERVICE CARD

available through a toll number or the MagicSoft BBS.

MTEZ provides straightforward and clear communications capabilities. You won't go wrong with MTEZ, although you won't go that quickly, either.

PereLine, Version 3.0

by Mike Byrd

PereLine is a \$49.95 commercial program that supplies a zesty menu system for the novice, extensive configuration options for the journeyman, and a script language with 188 verbs for the advanced user. *PereLine* even lets you reconfigure its menus: You can add titles, headings, footers, or additional features, or delete program options.

Installation of *PereLine* is painless, offering the advanced user a wide choice of configuration options. It supports many terminal emulations, including ADM3-5; ANSI; CompuServe Vdtext; Data General 210 and 410; DEC VT52, VT100, and VT220; HP 2621; IBM 3101; PTERM; and TTY. Its internal file-transfer protocols include ASCII, Kermit, Telelink, XModem (checksum and CRC), XModem 1K, YModem-batch, YModem-G, and ZModem. The program also lets you install external protocols with arguments.

Like *Mirror III*, *PereLine* uses the DSZ protocol module to provide ZModem operation. (You select it from within *Pere-*

Line the same way you choose the other protocols.) We found that the DSZ module would not operate at 115.2 Kbps on our Professional YAM tests, although the program shows the speed as an option on its menu. In fact, it ran at that speed for our Character-based ZModem tests. On those tests, however, it did not garner particularly high scores at any speed.

BACKGROUND MEMORY SWAP

If you are downloading files using internal protocols, you can shell to DOS and run other applications while *PereLine* transfers files in the background. *PereLine* keeps you aware of its progress by beeping each time it transfers a block and sounding an alarm when it finishes. *PereLine* also gives you a nifty feature that saves RAM when shelling to DOS by temporarily swapping memory to disk. Without memory swapping, *PereLine* uses about 216K RAM. With swapping, it consumes only 35K. The swap to the hard disk was faster than we anticipated, but if you use memory swapping, you cannot reenter *PereLine* until it completes a file transfer.

PereLine can also let you dial out to two remote computers and perform simultaneous operations on them (such as running programs). You can swap between the two session windows with a keystroke. The program's only restriction is that you cannot transfer files simultaneously in both sessions.

PereLine contains all the advanced features you would expect from its higher-priced cousins. You get a full-screen editor with word wrap, search, cut-and-paste,

SUITABILITY TO TASK

PereLine

Mini and mainframe connections	☐	☐	☐	☐
Automated information retrieval	☐	☐	☐	☐
Systems and calls management	☐	☐	☐	☐

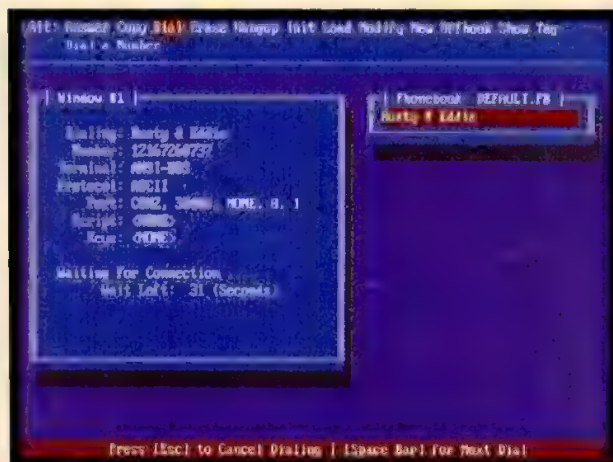
and block operations. The program's file manager lets you perform many DOS-like functions without leaving *PereLine*.

PereLine supports a mouse; it uses menu bars and pop-up vertical subwindows. A status line at the bottom displays context-sensitive information, and you can use an Alt-key sequence to move quickly between functions. If you're not sure which keys to press, an Alt-key menu pops up after a user-specified number of seconds of keyboard inactivity.

SECOND-GUESSING YOUR ENTRIES

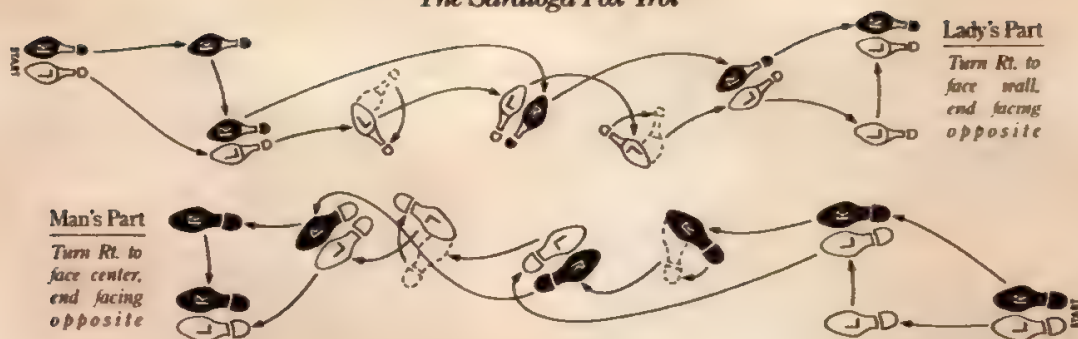
To simplify the creation of your phone directory, *PereLine* offers a feature that prompts you for the name and telephone number, then gives you a list of systems to select by name. Systems on the list are names of BBS types such as Fidonet, RBBS, and Galacticom, along with mainframes like IBM 7-bit PROFS and Data General 8-bit. If you select a listed system, *PereLine* will automatically install the correct communications settings for it.

PereLine offers some strong security features. You can password-protect program entry, blank your screen, and control remote system access. *PereLine*'s remote-operations feature can grant unlimited or restricted host privileges. It also includes e-mail capability.



At the top of the screen, *PereLine* displays a menu of actions you can take while it shows the progress of your call. One of the windows displays the phone-book entry you are currently dialing; to call the next entry you've tagged, just press the Spacebar.

The Saratoga Fox Trot

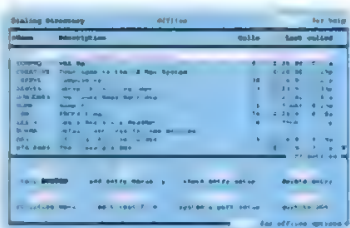


There's a time and place for complex steps. Communications isn't one of them.

INTRODUCING CROSSTALK COMMUNICATOR

With the new CROSSTALK® Communicator, getting on-line is now simpler and more logical than ever.

Unlike other communications software, where you have to go through set-up information like parity, databits, baud rate, etc., CROSSTALK Communicator's convenient dialing directory menu is already prepared to call services like CompuServe®, Dow Jones News/Retrieval®, and bulletin boards.



Unlimited connections are one step away with our dialing directory.

Plus CROSSTALK Communicator gives you all the necessary features for sophisticated communications.

Communicator knows the features of your modem, so file transfers are as efficient as possible.

Routine tasks can be automated without programming, utilizing our LEARN feature. It records your keystrokes and automatically creates scripts in CASL™, our industry standard scripting language. All you do is touch one key and replay when needed.

Plus, CROSSTALK Communicator includes offers for CompuServe, OAG®, Dow Jones News/Retrieval and other on-line services worth over \$150.



Trade in now for \$34.95.

There's also an economical upgrade path when you need communications products for networks, remote computing and Windows.

Best of all, CROSSTALK Communicator is a great deal at only \$99. And, for a limited time, you can trade in any asynchronous communications package, regardless of who you bought it from. **Trade up today and get CROSSTALK Communicator for only \$34.95 by calling 1-800-348-DCA1 ext. 67A.***

Could anything be simpler?

DCA



These products are an economical upgrade away.

File transfer protocols are just as complete. From XMODEM to ZMODEM plus CompuServe B+ and Kermit. Additionally, CROSSTALK

*Limit one per customer © 1990 Digital Communications Associates, Inc. All rights reserved. CROSSTALK is a registered trademark and CASL is a trademark of Digital Communications Associates, Inc. All other brand and product names are trademarks or registered trademarks of their respective owners.

CIRCLE 278 ON READER SERVICE CARD



See the Future.

The ideal 16-inch ergonomic monitor for professional graphics and business applications.

Maximum performance for CAD/CAM, spreadsheets, databases, WYSIWYG word processors and desktop publishing. Designed for PCs and Macintosh II.

1024 × 768 resolutions. Supporting the new, higher refresh rate of 70Hz and above for a flicker-free display. No distortion. Sharply focused. Bright images across the entire screen.

An anti-static, non-glare screen. Low magnetic radiation. No interference between two monitors separated by a mere six inches, for dual-display applications.

Microprocessor-controlled configuration for your applications, memorizing size and position of the screen settings you prefer.

Other monitors compete against the standards.
FLEXSCAN® sets them.

NANAO®

NANAO USA CORP.

23510 Telo Ave., Suite 5
Torrance, CA 90505 USA
Phone (213)325-5202
Fax (213)530-1679

CIRCLE 283 ON READER SERVICE CARD

FLEXSCAN 9080I

16" (15V), 0.28mm-dot pitch CRT
1024 × 768 Super high resolution with 70Hz
high refresh rate
Scan Frequency: Automatic Adjustment
H: 30-64kHz V: 50-90Hz
VGA, 8514/A and Mac II Compatible

COMMUNICATIONS ASYNCHRONOUS



FACT FILE

PereLine, Version 3.0
PereLine Data Systems Inc., 1299 Del Mar Ave., San Jose, CA 95128; 800-359-6612, 408-288-6612.

List Price: \$49.95.

Requires: 216K RAM (plus 40K for optional background file transfers), DOS 3.0 or later. Hard disk recommended.

In Short: For \$49.95, *PereLine* provides a friendly package with all the bells and whistles of more-expensive competitors. It's easy to use, and it lends itself to customized configurations. Its features, including swapping memory to disk in background mode and second-guessing your phone-directory options, make it a charmer.

CIRCLE 601 ON READER SERVICE CARD

PereLine's menus are intuitive, its user manual superb, and its operations straightforward, with a minimum of keystrokes required. The learning feature automates log-ons well. Although the program's context-sensitive help never did answer all of our questions, going back to the manual always yielded the solution.

PereLine comes with a 30-day money-back guarantee; technical support is free via a toll-free number to registered users. PereLine Data Systems also operates a technical-support BBS.

Although speed is not its selling point, *PereLine* features all the capabilities you expect from general-purpose software. It's easy to use, supports a range of terminal emulations, and provides strong security features. Perhaps one of its best features is a price tag that is more comparable to a shareware program's registration fee than to a commercial package.

ProComm Plus, Version 2.0

by Sara Parker

How do you take a full-featured communications package and make it even better? Ask Datastorm Technologies, the makers of *ProComm Plus*. The release of Version 2.0 adds many enhanced features to this popular product, such as ZModem

support, and many more terminal emulations and script language commands. At the time of our review, Datastorm was offering the package at an introductory price of \$119.

If ease of use is an important concern, *ProComm Plus* is one of the best communications products available. It's friendly from start to finish, with convenient pull-down menus. The sounds that emerge from this package make you feel as if you've stepped into a *Star Wars* movie. You can turn these special effects off if you like.

SLICK INTERFACE

ProComm Plus's slick installation process gives you a variety of options. You can choose your modem setup from a list of about 100 setup strings, and choose default download protocols from a menu of over 10. File-transfer protocols include ASCII, CompuServe B Plus, Kermit, XModem, ZModem, and more. Later, you can change over 100 session parameters, such as adjusting the bit-per-second rate within a range from 300 to 115,200, or selecting any of eight user-definable serial ports.

ProComm Plus's beautiful exploding menus add another dimension to the program, invoking the dialing directory, terminal emulation menu, and context-sensitive help facility. The command menu gives you a listing of communications options, including chat mode and log file. To save time, you can skip the command menu and execute commands at any time by using Alt-key combinations.

The dialing directory lets you add up to 200 names, numbers, and session settings for frequently called systems. You can create as many dialing directories as your disk can hold. *ProComm Plus* lets you set up a queue of numbers it will call until one is answered, or you can have it keep dialing the same number until it connects. It supports a whopping 33 terminal emulation types, including DEC VT52, VT102, VT220, and VT320, as well as IBM 3270 and 3101, ANSI, and TTY.

ProComm Plus includes some security features. Although it lacks a password protection option for local access, you can set up passwords when you use the program as a remote host.

The program's Aspect script language offers 208 verbs. You can use the program's learning feature to build a script



FACT FILE

ProComm Plus, Version 2.0
Datastorm Technologies Inc., 3212 Lemone Blvd., Columbia, MO 65201; 314-443-3282.

List Price: \$119.

Requires: 192K RAM, DOS 2.0 or later.

In Short: A powerful, intuitive package featuring pull-down menus, *ProComm Plus* is a joy to use. It includes built-in support for over 100 modems, a chat mode, and a dialing directory that contains up to 200 names, numbers, and session settings. Unfortunately, it failed to connect at the higher speeds on our Character-based ZModem tests.

CIRCLE 602 ON READER SERVICE CARD

from your keystrokes. *ProComm Plus*'s built-in editor can handle multiple files without trouble, and it includes a search-and-replace feature.

FILE-TRANSFER LOCKUPS

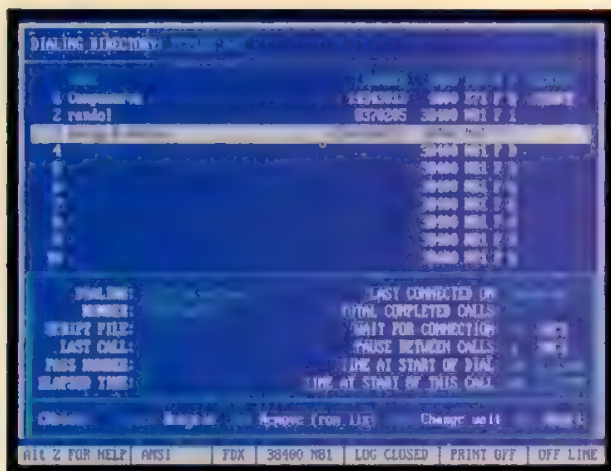
In addition to its built-in protocols, *ProComm Plus* supports three user-definable external protocols. A window showing the time estimate, byte count, and average characters per second, along with a bar graph, helps you monitor the file-transfer progress. *ProComm Plus* beeps when it completes a transfer.

ProComm Plus locked up several times during our testing of high-speed file transfers. During our Character-based ZModem tests, on an 8-MHz AT equipped with a 16550A UART, it consistently froze at every port speed faster than 38.4 Kbps on the receiving side of the link. This failure would seem to limit the program's usability with fast modems and slow machines.

SUITABILITY TO TASK	
ProComm Plus	
Mini and mainframe connections	☒ ☒ ☒ ☒
Automated information retrieval	☒ ☒ ☒ ☒
Systems and calls management	☒ ☒ ☒ ☒

However, on our Professional YAM tests, it not only connected at both 57.6 and 115.2 Kbps, it provided better scores than its competitors.

COMMUNICATIONS ASYNCHRONOUS



The dialing directory in *ProComm Plus* lets you select from multiple telephone entries. The program also allows you to track your phone calls, including the date you last connected, what time you started calling, and the total number of completed calls.

The program also consistently froze on the receiving side during file transfers when we tried to use a ZModem autostart from the transmitting side. This happened regardless of how we set the port speed.

The *ProComm Plus* package comes with both 3.5- and 5.25-inch disks and excellent documentation. The manual takes you step by step through actual communications sessions and includes helpful illustrations throughout. For further help, DataStorm offers technical support at a toll number during business hours. It also operates a BBS and the DataStorm forum on CompuServe. You can download a shareware version of *ProComm*, Version 2.4.3, from either place, as well as a demo version of *ProComm Plus*.

DataStorm has taken an already good communications product and made it into an even better one. *ProComm Plus* is not only chock-full of easy-to-use features, it makes communicating fun.

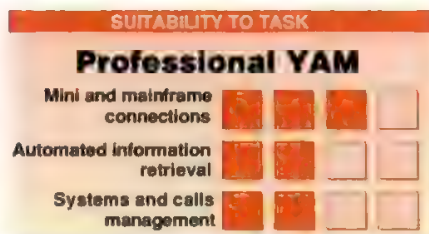
Professional YAM, Version 17.70

by Sara Parker

"Industrial-strength software" is the way Omen Technology describes its communications product. It has hit the nail on the head. *Professional YAM* (Yet Another Modem) doesn't give you fancy menus, but it does let you configure your communications session with your imagination as the only limitation. At \$139, this product isn't for those uninterested in learning about communications. *Professional YAM*

provides a no-holds-barred package with serious, no-frills documentation that nevertheless volunteers opinions about everything from modems to UARTs.

Omen Technology also developed the



ZModem file-transfer protocol. As you might expect, this product heavily stresses ZModem. You don't need any special skills to install *Professional YAM*. The only tricky part is setting up environment variables in DOS; the manual doesn't give the subject the attention it deserves.

You also need to set communications parameters ranging from one to eight COM ports, as well as parity, word size, hardware handshaking, and kilobit-per-second rate of up to 19.2 for menu selection and ranging all the way to 115.2 for the command line. The documentation suggests 19.2 as the optimum Kbps rate for *Professional YAM*, but with the new UARTs and faster modems with error correction, you'll probably want to use a port speed of at least 38.4 Kbps.

Professional YAM's file-transfer protocols include CompuServe Quick-B, Kermit, Modem7 batch, Telink, XModem, XModem 1K, YModem-batch, and, of course, ZModem. (It includes an auto-download feature for ZModem and Kermit.) XModem and YModem protocols in *Professional YAM* offer an option called

OverThrust that speeds throughput when you use modems with their own error-handling firmware.

Terminal emulations include ANSI; DEC VT100, VT102, and VT220; and Wyse 60 support; but not CompuServe Vidtex. More emulation options would greatly enhance *Professional YAM*.

Unlike most products we reviewed, *Professional YAM* lacks ease of use in scripting. You can use the program's learning mode to record your keystrokes and play them back later to automate key responses, but writing a script requires that you use terse commands to send text and set up the modem. Nevertheless, *Professional YAM's* script language is powerful.

Its command interface lets you optimize for speed without worrying about factors like menus that can slow you down. The documentation helps familiarize you with the language through examples and methodology tips.

SPEEDY PERFORMANCE, SOMETIMES

Professional YAM came away with some of the fastest file-transfer times of any program we tested when running at 57.6 and 38.4 Kbps. But at 115.2 Kbps, the program dropped out of the race with RTS/CTS (Request to Send/Clear to Send) flow control enabled. The ZModem file transfer generated so many errors and retries that the effective throughput dropped sharply. Interestingly, when we turned off the flow control protocols, *Professional YAM* showed the fastest



Professional YAM, Version 17.70

Omen Technology Inc., P.O. Box 4681,
Portland, OR 97208; 503-621-3406.
List Price: \$139.

Requires: 256K RAM, DOS 2.0 or later.

In Short: With its powerful but terse scripting language, *Professional YAM* is made for the serious communications programmer. But the product lacks support for some common terminal-emulation types and it won't move quickly at 115.2 Kbps with RTS/CTS flow control enabled.

CIRCLE 003 ON READER SERVICE CARD



SUBSCRIBER SAVINGS CARD

Save 62% • Get Free Software

Send in this card to get PC Magazine delivered to your home or office for as much as 62% off the price you'd pay at the newsstand.

Order now and you'll also receive The Best of PC MAGAZINE'S UTILITIES

This user-friendly, 2 disk set puts you in command of your DOS, video and printer functions—at the touch of a key. Yours FREE with your paid subscription.

NAME _____

(PLEASE PRINT)

5NH/7

PLEASE CHECK:

COMPANY _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

22 issues for \$29.97

SAVE 54%

44 issues for \$49.97

SAVE 62%

Please allow 30 to 60 days for delivery. Savings based on annual cover price of \$64.90. Basic annual subscription price is \$44.97. Please add \$31 per year for postage outside U.S., U.S. currency only. Your disks will be shipped upon payment.

☐ Payment enclosed.

☐ Bill me later.



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 66 BOULDER, CO

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. Box 51524
Boulder, CO 80321-1524



New!
CompuAdd CompanionSX™
Heavyweight Power Travels Light!
Only \$3595!



CompuAdd®
Customer driven, by design.™

CompuAdd CompanionSX™

Only \$3595!



Add on the optional numeric keypad for quick data entry.

The NEW CompuAdd CompanionSX continues the CompuAdd tradition of bringing you the latest PC technology plus all the famous CompuAdd extras! Powered by the Intel™ 20MHz 386SX microprocessor, the CompuAdd CompanionSX puts 32-bit processing power in a package less than two inches thick and only 5.7 pounds—almost

two pounds lighter than the Compaq LTE 386s/20!

Packed with features you expect on a 386 desktop computer, this 8-1/2"x11" notebook powerhouse sports a 20MB hard drive and a 1.44MB 3.5" floppy diskette drive! Plus you can expand the standard 2MB DRAM to 6MB.

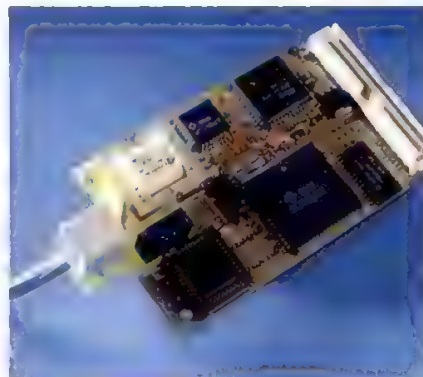
Now you can run all your favorite Windows applications on the road with the power of a desktop 386SX. Plus you get the security and convenience of a computer that stows in your briefcase—with plenty of room to spare!

CompuAdd extras include FREE CompuAdd Windows 3.0 (\$149 value), and FREE CompuAdd MS-DOS 4.01 (\$89 value) preloaded on the hard drive! Add in CompuAdd's award-winning customer service, and you have a system that travels light but works like a heavyweight!

This notebook-sized wonder gives you a 10" diagonal, mono VGA sidelit LCD screen that's crisp and legible in a variety of lighting conditions. And the built-in CRT Interface lets you hook up your full-sized color VGA monitor for desktop use.

The CompuAdd CompanionSX features a 79-key keyboard with separate cursor movement keys arranged in the inverted "T" preferred on desktop keyboards. The keyboard has the feel of your desktop keyboard, with solid tactile response and plenty of room between keys.

You can add capability to your CompuAdd CompanionSX as your needs require. Plug in an optional numeric keypad or add an optional internal modem to keep in touch when you're on the road.



Add an optional modem to keep in touch on the road



Standard I/O ports make peripheral hook-up easy.

The CompuAdd CompanionSX provides standard I/O ports—parallel, serial, PS/2 mouse and external VGA monitor—behind a convenient hinged door.

Carry the power of a 386SX anywhere! Call now and get an unbeatable portable—the CompuAdd CompanionSX notebook PC!

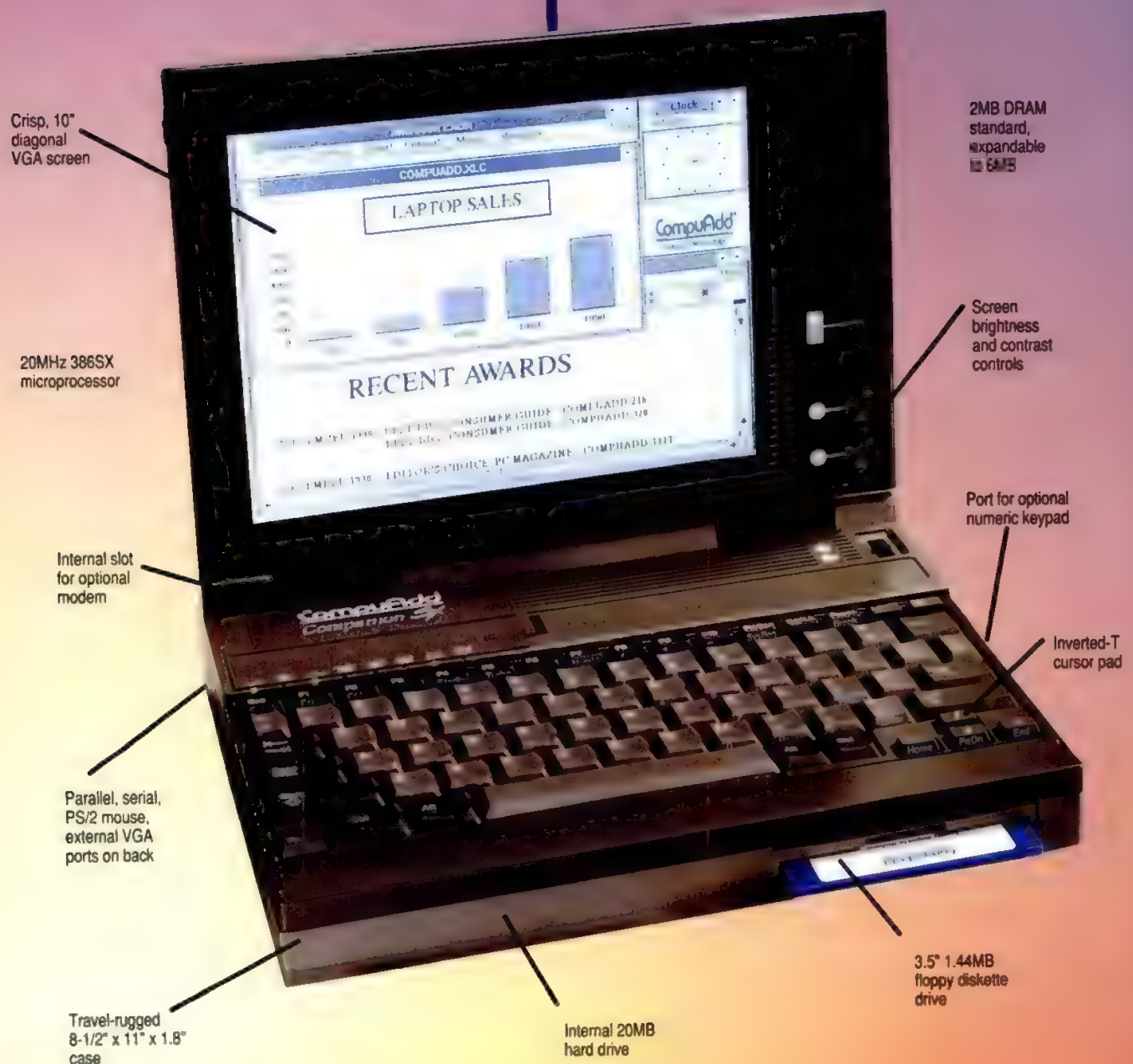
CompuAdd®

Customer driven, by design.™

12303 Technology, Austin, Texas 78727

C O M P U A D D

Lightweight 386SX Notebook Packs Heavyweight Features!



CompuAdd CompanionSX™ \$3595!

The NEW CompuAdd CompanionSX notebook continues the CompuAdd tradition of bringing you the latest technology at incredible savings! The CompuAdd CompanionSX is incredibly light and compact — only 5.7 pounds and 8-1/2" x 11" x 1.8". Yet it packs all the power of a desktop 386SX computer!

Equipped with a 20MB hard drive and a 3.5" 1.44MB diskette drive, the CompuAdd CompanionSX packs securely and discreetly in your briefcase with room to spare. You get the same functionality and software capability you have with a desktop computer, plus options that enable you to plug in to your office network,



send fax documents, download data from remote computers and send error-free file transfers. All this plus a crisp, 10" VGA display!

Call today for a CompuAdd price on the latest 386SX notebook technology!

CompuAdd 320sl Laptop

The NEW CompuAdd 320sl — a perfect on-the-go computing solution — upgrades our *hottest selling laptop* to 20MHz! It packs the power of the 386SX microprocessor into a convenient laptop — at a price far

below competitive models! Plus you get FREE CompuAdd Windows 3.0, FREE Microsoft Working Models, FREE CompuAdd MS-DOS 4.01, FREE LapLink II communications software, a FREE carrying case and a FREE CompuAdd mouse.

You'll find the crisp, clear VGA display and spacious keyboard a pleasure to use. And if you want to use your desktop color monitor and expanded 101-key keyboard when you're not on the road, simply plug them into the built-in external ports.

CompuAdd also offers portable printers, projectors and data displays to make your 320sl a complete office on the road! Check out the savings when you buy CompuAdd's 320sl Kit with Diconix printer and modem/send-only fax.

CompuAdd CompanionSX Features

- 80386SX microprocessor running at 20MHz
 - Standard 2MB DRAM expandable to 6MB
 - Built-in serial, parallel printer, numeric keypad, PS/2 mouse, and external VGA ports
 - Crisp, high-resolution 640x480 mono VGA display
 - 20MB hard disk drive with 23ms access speed
 - 79-key keyboard with 101-key emulation, 12 function keys
 - FREE! CompuAdd MS-DOS 4.01 \$89 value
 - FREE! CompuAdd Windows 3.0 \$149 value
 - Rechargeable/removeable internal battery pack
 - Modular AC adapter
 - Dimensions: 8.5" x 11" x 1.8"
- System Price: \$3595 (62301)**

CompuAdd 320sl Laptop

- 386SX microprocessor running at 20MHz
 - Standard 2MB high speed dynamic RAM expandable to 6MB
 - Built-in serial, parallel printer, and external VGA monitor, keyboard and 5.25" diskette drive ports
 - High-resolution 640x480 monoVGA display with 8.75" diagonal sidelit, supertwist LCD screen
 - 3.5" 1.44MB high-density diskette drive
 - 40MB hard disk drive with 28ms access speed
(call for optional 100MB drive prices)
 - 85-key keyboard with 101-key emulation, 12 function keys and 4 cursor keys
 - FREE! CompuAdd mouse \$24.95 value
 - FREE! CompuAdd Windows 3.0 preloaded \$149 value
 - FREE! Microsoft Working Models
 - FREE! CompuAdd MS-DOS 4.01 preloaded \$89 value
 - FREE! Carrying case \$59 value
- System Price: \$2895 (62205)**
Kit Price: \$3349 (62208)

CompuAdd®

Customer driven, by design.™



Call 800-456-3660

Key Code 815

Hours: Monday - Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
12303 Technology, Austin, Texas 78727

COMMUNICATIONS
ASYNCHRONOUS

The program requires over 3MB of disk space. Laptop users will need to have hard disks.

The program makes it easy to create phone directories and scripts. *QModem* allows 200 entries in each phone directory, with as many directories as disk space permits. You can have *QModem* automatically place the call after you choose an entry and then record your key sequences and the incoming data. You

Professional YAM's command interface lets you optimize for speed, with no menus to slow you down. Its scripting language is powerful, but writing a script directly requires you to use terse commands to send text and set up the modem.



QModem, Version 4.2E

The Forbin Project Inc., P.O. Box 702, Cedar Falls, IA 50613; 319-266-0543.

List Price: Registration fee, \$30; manual, \$29.95; disk copy, \$20.

Requires: 384K RAM, DOS 2.0 or later.

In Short: QModem benefits from its user-friendliness and low cost. It also elegantly couples terminal emulations and file-transfer protocols with superb script learning. Oddly enough, it performed better at slower speeds on our Character-based ZModem tests.

CIRCLE 104 ON READER SERVICE CARD

transfer times at 115.2 Kbps. Handling the RS-232 flow control signals apparently inhibited the flow of data on the slower PC used in our tests.

ZCOMM, a shareware subset of *Professional YAM*, is available on BBSs and in CompuServe's IBMCOM forum for those who want to test-drive a scaled-down version of the product. You can receive a registered copy of **ZCOMM** for \$50, enabling you to upgrade to *Professional YAM* for \$99.

Omen Technology also makes versions of *Professional YAM* for the OS/2, SCO Xenix/Unix/ODT, 386 Unix, and VAX/VMS environments; these sell for \$139 each. Technical support hours are limited from 1:30 P.M. to 5:00 P.M. Monday through Friday at a toll number.

Professional YAM's major advantage lies in its no-nonsense approach to PC communications. If you want an easy-to-use product, look elsewhere. This package is just about as powerful as communications products come, but along with that power comes the need to know your stuff in the communications arena. If you're a power user who doesn't like limitations, you will like *Professional YAM*.

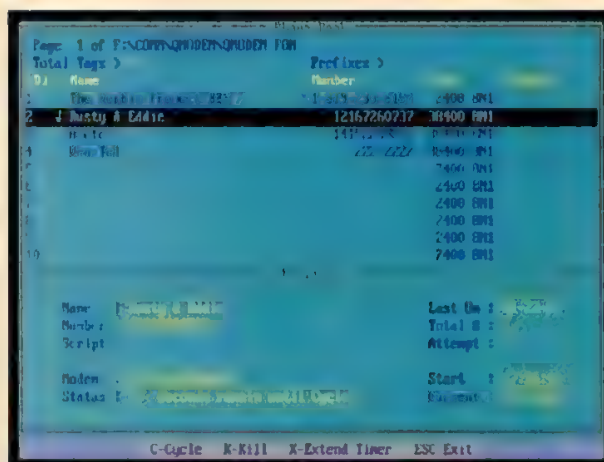
QModem, Version 4.2E

QModem, Version 4.2E, is available from The Forbin Project for only a \$30 registration fee. This shareware product includes much of the functionality of commercial programs, but is faster and friendlier in

many respects. *QModem* combines ease of use with a capable script language, seven terminal emulations, and a robust command-line help table.

QModem normally comes in four compressed files. The version we tested, 4.2E, is available from CompuServe's IBMCOM forum in files named QM42*.ZIP, totaling about 703K. Installation is painless. You decompress the files into a subdirectory and type QMODEM to start the program. It recognizes that it is running for the first time and guides you through a sequence of installation menus, with context-sensitive help available to assist with every option. You can press the Home key at any time to display a quick-reference table. For the hardware setup menus, *QModem* offers a choice of 71 modem setup strings. Once installed, *QModem* relies primarily on Alt-key combination sequences to initiate actions.

can then tell the program to stop recording at any time. We found no errors during testing of this feature. If you program with *QModem's* script language, you have access to 56 verbs, fewer than many competitors, but still useful.



A dialing directory in the shareware program *QModem* lets you select multiple telephone entries or manually cycle through the entries. *QModem* allows 200 entries in each phone directory, with as many directories as disk space permits.

QModem supports seven terminal emulations: ANSI, AVATAR, DEC VT100, DEBUG_A, DEBUG_H, TTY, and TVI925. DEBUG_A displays all incoming characters, including control characters and escape sequences, in ASCII. DEBUG_H gives the same information in hex.

Built-in *QModem* file-transfer protocols include ASCII, XModem, XModem-1K, YModem-G, and ZModem, among others. *QModem* also allows you to specify external protocols and easily incorporate them into the protocol window. The program lets you set the port speed at up to 115.2 Kbps.

QModem does not contain an internal



file viewer or editor but lets you use your favorites. Shelling to DOS is equally easy, since *QModem* can swap all but 4K to disk. It does not, however, support background file-transfer capabilities.

You can operate the program in host

mode as a mini-BBS. It supports a mail system in this mode and several levels of security, including sysop mode.

The program provided generally good performance at the highest speeds on our Professional YAM tests, but came in with low-level scores at 115.2 Kbps on our Character-based ZModem tests. On those tests, though, it garnered scores very close to the top when running at 38.4 Kbps.

SHAREWARE EVALUATION

If you don't want to download *QModem* from a BBS or an on-line service like CompuServe, The Forbin Project will mail you an evaluation copy for \$20. If you like it, you pay the \$30 registration fee, enti-

COMMUNICATIONS FOR DATABASES

by Joe Salemi

A common use for a communications program in the business world is transferring data from a host database (mainframe-, minicomputer-, or PC-based) to a standalone PC for manipulation, and then back to the host for updating and storage. While this can be done with just about any of the general-purpose communications programs, the process is complicated. The user has to dial into the host system, either manually or through a script written in the native language of the communications program, and download the data to a local file. Then the user has to fire up the database program and run a custom-written routine to import the data into the database. This requires either too much manual intervention, or knowing and programming in two different languages. While this process works, the number of different steps needed increases the chances of something going wrong.

For *dBASE* and *dBASE*-compatible software, there is another solution to this problem—communications libraries and routines that can be included as part of the database application itself. This method simplifies the process twofold; the programmer need program in only one language, and there are no intermediate steps to cause outside problems. By using these routines, the *dBASE* programmer can have his application dial up the host system and download the data directly into the database. File transfers are two-way, so data can also

be sent from the remote systems to a central database. Applications that can use these communications routines abound; for example, a point-of-sale system can have the PC-based cash registers dial the central database at company headquarters, upload the day's sales, and then download any price or product change. The possibilities are limited only by the imagination of the application developer.

CompuSolve's *Comet*, Version 2.41 (\$99), and SilverWare's *The SilverComm Library*, Version 2.05 (\$189), are examples of two such communications libraries. *Comet* supports *dBASE III Plus*, *dBASE IV*, *FoxBASE Plus*, *FoxPro*, *dBXL*, *QuickSilver*, and *Clipper*, and is the simpler of the two libraries to use. The single-port version supports one comm port (either COM1 or COM2); the multiport version supports up to five comm ports at the same time, using various multiport boards. The communications routines are contained in a .BIN file (.OBJ file for *Clipper*) that is included in the application through the LOAD command. An important feature of *Comet* is its support for background file transfers; once a transfer begins, the application can continue to do other processing until *Comet* signals that the transfer is complete.

Comet includes 21 communications functions, and supports ASCII and the XModem and YModem file transfers. The functions are accessed within the *dBASE* program through the "CALL

COMET WITH <variable_name>" command, where the variable contains a string defining the function and its parameters. The manual included with *Comet* is a mere 29 pages. Each function is described on a single page, with a short example showing how to use it. The manual includes source code for a simple terminal program to further demonstrate how to use *Comet*.

A LOOK AT SILVERCOMM

SilverComm supports the same list of *dBASE*-compatible software as *Comet*, with the exception of *dBASE IV*. It includes support for COM3, COM4, and the AST 4 PORT AT board, for a total of up to five comm ports. A .LIB library is provided for *Clipper3* and compiled *Quicksilver* applications, and a set of .BIN and .PRG files are provided for interpretive systems (such as *dBASE III Plus* or *FoxBASE Plus*). For interpretive systems, a loader program accesses the proper database executable file and sets up the *SilverComm* library for use.

There are over 100 functions in the *SilverComm* libraries that provide complete control over the comm port, modem (including a set of Smartmodem-specific commands), screen display, terminal emulation, and file transfers. It supports ASCII and XModem and YModem file transfers. The calling convention for the functions is more complex than *Comet*; it passes parameters to the functions as variables. The manual, over 250 pages, includes a

COMMUNICATIONS ASYNCHRONOUS

ting you to lifetime upgrades and one year of free support at a toll number or on the Forbin BBS. Forbin also operates a forum on GENie.

QModem provides full-featured, user-friendly communications with no glitches or sacrifices in capability. It's quite a buy for the price.

Smartcom Exec, Version 2.0

by Mike Byrd

Hayes's *Smartcom Exec* stands midway between the company's *Smartcom III* and

primer on communications and detailed programming examples for each function. There is also a glossary of communications terms and an appendix that contains ANSI and ASCII codes and the pin-outs on RS-232 ports.

The package includes a powerful sample communications program and sample code for other communications tasks, such as reading bar code data or automating uploads and downloads. *SilverComm* also provides a help database that works with the memory-resident *Norton Guides* utility.

SilverComm is a powerful tool for handling communications from within a database, and can handle just about any communications task needed. If it's power you want (and you don't use *dBASE IV*), you should definitely take a look at it. If your communications needs are simple and you require that communication be done in the background, *Comet* may well be all you need. ■

Comet, Version 2.41

CompuSolve, 88 Erie Ave.,
Rockaway, NJ 07866; 201-983-9429.
List Price: \$99. Requires: 20K RAM,
DOS 2.1 or later.

CIRCLE 616 ON READER SERVICE CARD

The SilverComm Library, Version 2.05

SilverWare Inc., 3010 LBJ Frwy.,
#740, Dallas, TX 75234; 214-247-
0131.

List Price: \$189. Requires: 60K
RAM, DOS 2.1 or later.

CIRCLE 617 ON READER SERVICE CARD

Smartcom EZ, incorporating some of the advanced capabilities of one and the operating simplicity of the other. For \$129, you get a complete communications package that includes a comprehensive script language, a built-in text editor, the ability to share modems across some LANs, and support for the Hayes Enhanced Serial Processor card. But perhaps one of its most enticing features is its rapid-fire speed.

During installation, the Install program doesn't prompt you for your modem type, but automatically sets itself up for Hayes and Hayes-compatible modems. If you have an incompatible modem type (and most users won't), a screen pops up asking for setup strings when you first run the *Smartcom Exec* program.

You can operate *Smartcom Exec*, which supports a mouse, through a series of menu windows or the shortcut keys displayed with each menu item. Most menu items are clear and specific; *Smartcom Exec* uses the bottom display line as a reminder line for available function key operations. Context-sensitive help is always available via the F1 key.

METICULOUS PHONE BOOKS

Smartcom Exec's phone-book management is comprehensive and meticulous, letting you set modem and program settings for each phone entry. You can also run scripts through the phone book for tasks other than communications, like file management.

Overall, operation is simple. Once you select a phone-book entry, the program automatically resets the modem and makes

the call. *Smartcom Exec* makes call-progress monitoring easy with a pop-up window displaying the modem reset, dial, and connect settings, followed by the connection speed and protocol. A function key lets you quickly switch between on-line operations and off-line setup. The only glitch we found here revolved around our specifying ZModem as the default file-transfer protocol when we set up the Hayes

SUITABILITY TO TASK

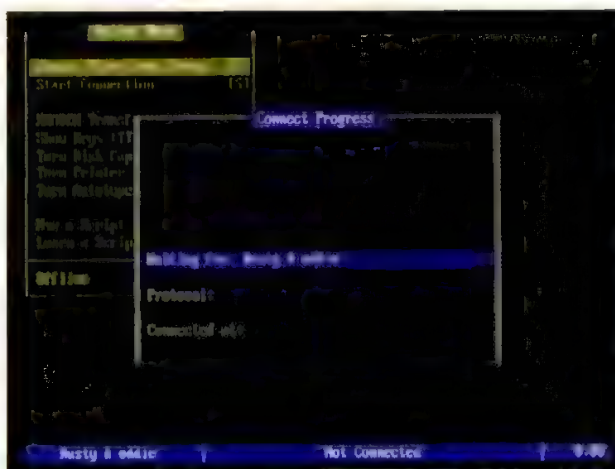
Smartcom Exec

Mini and mainframe connections	☒	☒	☒	☒
Automated information retrieval	☒	☒	☒	☒
Systems and calls management	☒	☒	☒	☒

BBS entry, as recommended by the user guide. When we tried to download a file from the Hayes BBS, we found it did not offer ZModem as an option. This caused a hurried excursion to the off-line menu for a real-time dialing-directory modification.

Smartcom Exec's terminal emulations include ANSI, DEC VT102, Show Control, and TTY. The DEC emulation also supports VT100 and VT102 keyboard functions, continuous printing, and VT100 visual attributes. The Show Control emulator displays unfiltered incoming data, including control codes and escape sequences. You can program keyboard macros to return a series of terminal emulator keystrokes.

Smartcom Exec supports Autotype, Kermit, XModem, XModem 1K, YModem batch, YModem-G, and, of course, ZModem file-transfer protocols. The Autotype protocol is similar to an ASCII



Smartcom Exec displays clear, specific menus and call-progress-monitoring windows. You can start a script, capture your session on-disk, or send the session to a printer from the same uncomplicated menu. The program supports a mouse, and its ease of use is a plus.

THE 16550A UART: Breaking Old Bottlenecks

FIFO.COM can help you activate the UART buffer on your side of a high-speed link.

by Randol Tigrett

If your computer includes a 16550A UART, chances are you'll get faster throughput during your communications sessions if your communications software takes advantage of it, but not all programs have this capability. If the communications software you presently use doesn't activate the 16550A but you do have the chip in your PC, you can still experiment with the UART by using the DEBUG script shown in Figure 1 to generate a small program called FIFO.COM. If you're a *Microsoft Windows* 3.0 user, you can use FIFO.COM to partially offset Microsoft's oversight in not turning on the 16550A FIFO buffer in *Windows*' COMM.DRV driver. If you simply run FIFO.COM once when you turn on your PC, it will activate the FIFO buffers in the UART.

We emphasize the word *experiment* because some communications programs written before the introduction of the 16550A might lock up when the UART activates the previously unused upper bits of the Interrupt ID Register. Even if your communications software doesn't lock up with the FIFO buffer activated (and most packages don't), you still won't get the full benefit of the FIFO buffer, as you do when the program itself makes use of it.

Programs not specifically written for the 16550A won't move data in large blocks the way more-modern programs do, and FIFO.COM can't make your communications program recognize the UART or use its FIFO buffer better. But activating the buffer with FIFO.COM can potentially eliminate problems of overrunning the UART, particularly in a PC on the receiving side of a high-throughput file transfer.

The NS16550AF UART (Universal

```

A
JMP      0123
NOP
AND      [BX+DI],DH
SS:
XOR      AX,3035
AND      [DI+41],DL
PUSH     DX
PUSH     SP
AND      [BX+SI],AH
AND      [BX+SI],AH
AND      AL,20
CMP      [BP+SI],DH
XOR      AX,2030
PUSH     BF
INC      CX
PUSH     DX
PUSH     SF
AND      [BX+SI],AH
AND      [BX+SI],AH
AND      [SI],AH
MOV      DX,03F8      /* PORT ADDRESS - 0040:0000 */
ADD      DX,+02      /* set offset to IIR Register */
MOV      AL,C1      /* set receive buffer to 14 and enable */
OUT      DX,AL      /* change the 14 = 0x0C to 1,4,or 8 */
XOR      AX,AX
IN       AL,DX
PUSH     AX
AND      AL,C0      /* set up for 16550A UART */
CMP      AL,C0      /* is it a 16550A ? */
JNZ      013D      /* no */
LEA      DX,[0103]   /* yes */
JMP      0141
NOP
LEA      DX,[0113]   /* print either 16550 or 8250 */
MOV      AH,09
INT      21
POP      AX
MOV      AH,4C      /* show the IIR setup as errorlevel */
INT      21
RET

N FIFO.COM
RCX
4B
W
Q

```

Figure 1: DEBUG script to generate FIFO.COM, a program that activates the 16550A UART's FIFO buffer.

Asynchronous Receiver/Transmitter) contains two 16-byte FIFO (first in, first out) buffers. Slower machines (like an 8-MHz AT) using fast modems need these buffers, as do faster machines (like a top-of-the-line 33-MHz 386) that attempt to run other programs in a multitasking mode while using asynchronous communications. The interrupts gener-

ated by communications sessions can have a serious impact on the effectiveness of computers running multitasking operations. Programs in other sessions suspend processing, displays don't update, and characters typed at the keyboard don't register while the CPU services the UART.

The 16-byte FIFO buffers reduce the

COMMUNICATIONS ASYNCHRONOUS

interrupt activity of the CPU because they can hold more data before generating an interrupt requesting a transfer. This makes it easier for slower CPUs to avoid dropping characters when they receive a fast stream of data. You can set the receive FIFO buffer to receive 1, 4, 8, or 14 characters before the UART generates an interrupt.

If your computer contains a 16550 UART instead of the 16550A or AF, be aware that the plain 16550 was flawed and will not work correctly if the FIFO buffers are activated, whether by the communications software or FIFO.COM. The 16550A UART is especially useful for communicating with high-speed modems because, with the advent of V.32bis modems, you can now enjoy a carrier rate of 14.4 kilobits per second between modems. With V.42bis data compressions of 4 to 1, you must set the DTE (Data Terminal Equipment) speed of the RS-232C link to 57.6 Kbps to achieve optimum performance during file transfers. Slower computers are not able to handle the high RS-232C DTE speed without the 16550A UART.

If you want more information on programming the 16550A UART, a good reference is *Data Communications: Local Area Networks: UARTs* from National Semiconductor Corp. (408-721-5000).

HOW TO GET FIFO.COM

You can download FIFO.COM from library 2 of PC MagNet's Utilforum/Tips forum (type GO PCM:TIPS from PC MagNet or CompuServe to get there) or create it using the DOS DEBUG program.

Assuming DEBUG is available in the C:\root directory of your machine, redirect the following text to DEBUG by typing

```
c:\debug <fifo.scr
```

The text in Figure 1 contains comments to illustrate the program's operation. Remove all comments enclosed in /* */ before redirecting to DEBUG. ■

transfer, allowing you to type a file directly to a remote computer. You can set the port speed at up to 115.2 kilobits per second.

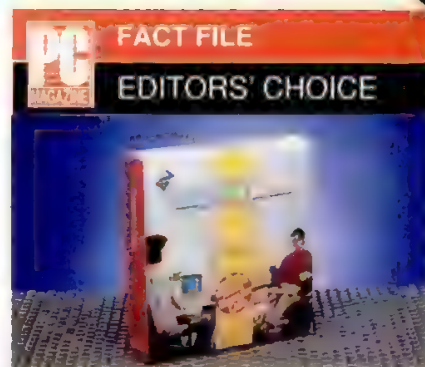
SCRIPT AUTOMATION

Smartcom Exec's extremely capable script language, SCOPE (Simple Communications Programming Environment), automates repetitive or complicated tasks. SCOPE lets you create and customize windows, menus, tables, and selection dialog boxes. It provides a programming interface to data, keyboard, and communications functions, and includes 191 verbs. The learning option automatically creates scripts for subsequent reuse. No pre-canned scripts are included, although you can download scripts for CompuServe, Dow Jones News/Retrieval, MCI Mail, OAG, PC MagNet, and others from the Hayes BBS.

Additionally, *Smartcom Exec* provides an easy way to share information from *Smartcom III*. You can import *Smartcom III* connection parameters, SCOPE scripts, and user options directly into *Smartcom Exec*.

Smartcom Exec includes a range of other important features. Among these are a capture buffer for temporarily storing on-line information in RAM, a disk capture for saving on-line text in a disk file, concurrent printing of the session with hard copy, remote operation with unlimited and restricted privileges, a built-in text editor including search-and-replace and block operations, and password protection on the host and local level. *Smartcom Exec*'s security features give you a fairly good sense of protection. The program also includes an option to log calls, but we were unable to get that to work.

In our Character-based ZModem performance tests, the package achieved the fastest implementation of ZModem with RTS/CTS (Request to Send/Clear to Send) flow control. On the Professional YAM tests, it trailed just behind *ProComm Plus*. It still held the advantage over that product, though, for *ProComm Plus* failed high-speed transfers on the Character-based ZModem tests we put it through. It also bested *Professional YAM* at 115.2 Kbps on the Professional YAM tests. *Smartcom Exec* showed itself to be a solid performer from a company experienced at getting performance from serial ports and modems.



Smartcom Exec, Version 2.0

Hayes Microcomputer Products Inc., P.O. Box 105203, Atlanta, GA 30348; 404-449-8791.

List Price: \$129.

Requires: 512K RAM, DOS 2.0 or later.

In Short: The intelligent *Smartcom Exec* package offers varied terminal emulations and file-transfer protocols, a complete script language, and an easy-to-operate menu system. It also provides top-flight performance and the backing of a company with plenty of communications experience. It's a smart purchase or upgrade for anyone who wants power and speed.

CIRCLE 606 ON READER SERVICE CARD

Hayes provides free technical support at a toll number. The Hayes BBS on CompuServe offers four toll-free lines for messages, and four toll lines for file uploads and downloads.

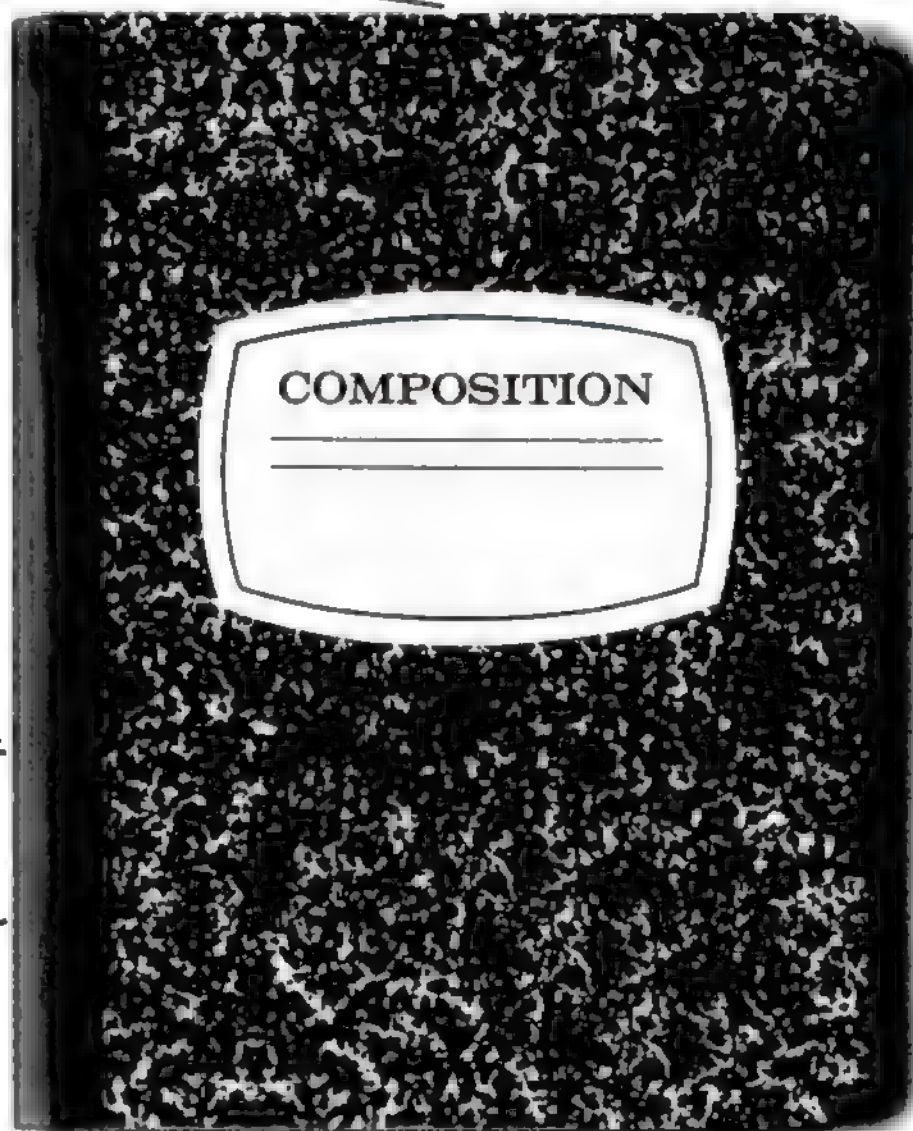
The package includes a user manual, a script-language reference guide, and a handy quick-reference card. The program's documentation is excellent and in line with Hayes' high standard. *SmartCom Exec* makes sense for many users, from those wishing to upgrade from *Smartcom EZ* to anyone looking for top-flight speed.

Telix, Version 3.12 by Sara Parker

If you need an economical way to transfer files or perform almost any communications-related task, take a look at *Telix*, a shareware product from Exis. *Telix* is easy to use and inexpensive. You can download the program from BBSs or library 3 in CompuServe's IBMCOM forum. You pay only \$39 to register your copy of the program and receive the disk—you have to print out the documentation yourself. Exis plans to release a commercial version of *Telix* at some point this year.

After installation, pressing Alt-Z gives you a list of options to get you started.

Dimensions: 7.5 x 9.75 x .25"



\$2.49

No leasing plan available.

Multiple, non-glare,
paper-white screens

Speed: 20 wpm

200 pages of
non-expandable memory

WE FOUND A NOTEBOOK THAN THE NEW 20 M WE'RE STILL LOOKING FOR O

As you can see, there are few notebooks more affordable than the new 20 MHz Tandon NB/386sx. That's because our new notebook's only \$3,495, a price thousands of dollars less than most other computers in its class. And in addition to great savings, you get a superior, full-functioning computer with standard features that are options on most other notebooks.

The ready-to-go Tandon NB/386sx boasts the 20 MHz Intel® 80386SX processor, the highest level of power you can get in a battery-powered notebook today. But that's just for starters. You also get a 30MB IDE hard drive and a 3.5" internal floppy drive, 2 MBs of memory expandable to a whopping 16MBs, and three hours of battery life. Not bad for a 6.5 lb. machine small enough to fit on this page.

The NB/386sx is extremely versatile, too. It has one parallel port and two serial ports. So you can plug into a large combination of devices like a printer, mouse, graphic tablet, or modem. At the office, you can connect up to an external monitor and keyboard, or even communicate with your

company's larger computers.

And while the Tandon notebook may be extremely small, its extra large 9 inch, non-glare VGA display makes even the most complex graphics easy to read. The paper-white screen, specially designed to reduce eye strain, provides a sharp, bright image using triple super twist LCD technology.

Of course, with any Tandon Computer you also get the support you expect from a \$400 million corporation. Prompt delivery, a one year limited warranty, and helpful toll-free tech support. We even offer a special leasing program. And if for any reason you're not pleased, you get a full refund within the first 30 days.

So if you're interested in a great little portable computer with desktop performance, call us today about the new Tandon NB/386sx or the Tandon NB/386sx, Model 60 with a 60MB hard drive, for only \$3,995.

There are other ways to save thousands of dollars on a notebook, but just none quite as practical.

**IMMEDIATE
DELIVERY
AVAILABLE.**

Dimensions: 8.5 x 11 x 2.1"

\$3,495

Lease: As low as \$123/month

Non-glare, paper-white
VGA screen

Speed: 20 MHz

2 MBs of memory
expandable to 16 MBs



**K WITH A BETTER PRICE
Hz TANDON NB/386sx.
NE WITH BETTER FEATURES.**

**“Tandon moves to the head of the class
when you compare Notebook features you
get for the dollars spent.”**

Byte, March 1991

	Tandon NB 386sx/20	Compaq LTE 386s/20	T.I. Travelmate 3000
Max RAM	16MB	10MB	6MB
Base RAM	2MB	2MB	2MB
Hard Drive	30MB	30MB	20MB
Hard Drive Option	60MB	60MB	40/60MB
Screen	VGA	VGA	VGA
Dimensions	8.5"D x 11"L x 2.1"H	8.5"D x 11"L x 2.2"H	8.5"D x 11"L x 1.8"H
Weight	6.5 lb.	7.5 lb.	5.7 lb.
Price	\$3,495.00	\$6,499.00*	\$5,499.00*

*List prices published by Hard Facts, Beverly, M.A., January, 1991
Actual dealer prices may vary.

- 30-Day Money Back Guarantee
- 1-Year Limited Warranty
- 24 Hour Toll-Free, On Call Technical Support
- Leasing Program Available

Tandon

TO ORDER DIRECT, CALL NOW:

800-800-8850

FAX 805-529-8408

Tandon reserves the right to amend specifications without notice. Tandon 486, Tandon 386, SL386sx, SL 486, LT/286, LT/386sx, 386sx/N, 286/N, NB/386sx Tandon Tower 386, Tandon Tower 486, PowerPoster, MultiCACHE and MIAT are trademarks of Tandon Corporation. Intel is a registered trademark of Intel Corporation. All other products or services are identified by the trademarks or service marks of their respective companies. Lease terms vary by system.
©1991 Tandon Corporation, Moorpark, CA.

CIRCLE 508 ON READER SERVICE CARD



THE FIRST 486 WIT

You no longer need the budget for a 486™ computer in order to own one, thanks to the Tandon SL 486/25 Slimline.

That's because the SL 486/25 costs just \$2,999, thousands of dollars less than most other 486's. But more than that, Tandon's the first to offer a 486 at a 386™ price that includes exclusive Tandon features, as well as the quality that comes from fifteen years of industry experience and an engineer-design team with 16 patents to their credit. That's why the SL 486 is more than just a great buy, it's a great machine.

To start with, we used the Intel® 80486 chip with its built-in numeric coprocessor and 8k memory cache. The cache provides faster memory reads and the coprocessor handles even the most difficult calculations with the utmost speed.

Then, to help maintain the power of a big machine in a little package, we designed it with a Tandon exclusive called the PowerPoster™. It's an intelligent write buffer that accelerates most write operations to RAM at four times the rate of un-enhanced 486's.

- 30-Day Money Back Guarantee
- Toll-Free Technical Support
- 1-Year Limited Warranty
- On-Site Service

To empower this slimline even more, we incorporated another Tandon feature. Our exclusive MIAT™ (Mapper-Integrated AT) chip for greater interpretation and reliability. Then we added the Tandon Memory Mapper, which provides Flex Shadowing of

RAM for faster processor performance. Together, these innovations help to give you one fast machine in one attractive slim case for one really low price.

Of course, with any Tandon Computer you also get the support you'd expect from a 400 million dollar corporation. Like prompt delivery, a one year limited warranty, on-site service, and helpful toll free tech support. We even offer a special leasing program. And if for any reason you're not pleased, you can get a full refund within the first 30 days.

So if you're interested in a high powered, compact, 486 machine that costs about the same as most 386's, call us today and ask about the Tandon SL 486/25 Slimline. Its performance will truly impress you, almost as much as its price.



Tandon SL 486/25 Slimline
SPECIAL OFFER:

\$2,999

Lease: As low as \$105/month.

H A 386 PRICE TAG.

THE TANDON UPGRADE PACKAGE OFFER*

AVAILABLE FOR JUST \$1000.
Includes: 110MB Hard Drive
VGA Color Monitor (640x480 Resolution)
Microsoft® Windows™ 3.0 Mouse

Tandon SL 486/25: \$2,999 • Price includes: system unit, 2MB RAM, 1.2 or 1.44MB diskette drive, VGA monochrome monitor, 16-bit video card, keyboard, power cord, Tandon MS-DOS software and manual, operating and installation manual. • **Options:** 1MB or 2MB memory upgrade kits; additional 1.2MB and 1.44MB diskette drives; 110MB or 200MB IDE hard disk drives; VGA and Super VGA color monitors, 2400 baud modems, network cards, laser printers, Microsoft® Windows™ 3.0 and serial mouse. Additional options and features are available. *Available only with Tandon SL 486/25 systems. **Call for details on our family of Slimline computers.**

CIRCLE 744 ON READER SERVICE CARD

OPTIONS AND CUSTOM CONFIGURATIONS

- Hard Drives, Diskette and Optical Drives
- VGA and Super VGA Monitors
- Modems
- Additional Options Available On All Systems. Please Call.
- Memory Expansion
- Coprocessors

Tandon

TO ORDER DIRECT, CALL NOW:

800-800-8850

FAX 805-529-8408

Tandon reserves the right to amend specifications without notice. Tandon 486, Tandon 386, SL386x, SL 486, LT/286, LT/386x, 386sx/N 286/N Tandon Tower 386, Tandon Tower 486, PowerPoster, MultiCACHE and MMAT are trademarks of Tandon Corporation. Intel is a registered trademark and 486 and 386 are trademarks of Intel Corporation. All other products or services are identified by the trademarks or service marks of their respective companies. ©1991 Tandon Corporation, Moorpark, CA. Leasing terms vary by system.



TANDON PROUDLY ANNOUN

We took our SL 386sx Slimline personal computer, upped its processing speed to 20 MHz. And managed to keep its price down. Under \$2,000. The result is the Tandon SL 386sx/20. A machine that offers a few ups and downs of its own.

For starters, processing speed is up, so processing time is down. Because we've combined INTEL® 80386SX power with full 32 bit internal processing, at a speed of 20 MHz.

And size is down. Because we've packed all this into a machine that stands only 5" tall.

But system integration is up. Because the Tandon SL 386sx/20 incorporates our proprietary MIAT™ (Mapper-Integrated AT) chip, for reduced chip count and increased reliability. Built-in communication ports

and mass storage controllers on the main board provide an even higher level of integration.

And expandability is up. With two serial ports and one parallel port. And 1MB of memory is standard; expandable to 5MB on board, with a 16MB maximum using an expansion card.

Of course, with any Tandon computer we provide you with a one year limited warranty. Helpful technical support. On site service, if you ever need it. A 30 day no questions asked, full refund policy. Even a special leasing program.

So call Tandon today to find out more about the Tandon SL 386sx/20. Or for even more power, ask about our SL 486/25. They both have their ups and downs in all the right places.

- 30-Day Money Back Guarantee
- 24 Hour Toll-Free, On Call Technical Support
- 1-Year Limited Warranty
- On-Site Service

Tandon SL 386sx/20

Now
\$1,999

Lease: As low as \$114/month.

ACES SOME UPS AND DOWNS.

Tandon SL 386sx/20 • Price includes system unit, 1MB RAM, 40MB IDE hard drive, 1.2 or 1.44MB diskette drive, VGA monochrome monitor, 16-bit video card, keyboard, power cord, operating and installation manual. • **Options:** 1MB and 2MB memory upgrade kits; Microsoft® Windows™ 3.0 and serial/bus mouse; additional 1.2MB and 1.44MB diskette drives; 110MB, 200MB IDE hard disk drive; VGA and Super VGA color monitors, 80387SX math coprocessor, 2400 baud modems, network cards, laser printers, Tandon MS-DOS software and manuals. **Tandon SL 486/25** • Price includes: system unit, 2MB RAM, 110MB IDE hard drive, 1.2 or 1.44MB diskette drive, VGA monochrome monitor, 16-bit video card, keyboard, power cord, Tandon MS-DOS software and manual, operating and installation manual, Microsoft® Windows™ 3.0 and serial mouse. • **Options:** 1MB and 2MB memory upgrade kits; additional 1.2MB and 1.44MB diskette drives; 200MB IDE hard disk drive; VGA and Super VGA color monitors, 2400 baud modems, network cards, laser printers. Additional options and features are available. **Call for details.**

OPTIONS AND CUSTOM CONFIGURATIONS

- Hard Drives, Diskette and Optical Drives
- VGA and Super VGA Monitors.
- Modems
- Additional Options Available On All Systems. Please Call.
- Memory Expansion
- Coprocessors

Tandon

TO ORDER DIRECT, CALL NOW:

800-800-8850

FAX 805-529-8408

CIRCLE 312 ON READER SERVICE CARD

Tandon reserves the right to amend specifications without notice. Tandon 486, Tandon 386, SL386sx, SL 486, LT/286, LT/386sx, 386sx/N, 286/N, Tandon Tower 386, Tandon Tower 486, PowerPoster, MultiCACHE and M4AT are trademarks of Tandon Corporation. Intel is a registered trademark of Intel Corporation. All other products or services are identified by the trademarks or service marks of their respective companies. ©1990 Tandon Corporation, Moorpark, CA.

COMMUNICATIONS ASYNCHRONOUS

SUITABILITY TO TASK

Telix

Mini and mainframe connections	☒	☐	☐	☐
Automated information retrieval	☒	☒	☐	☐
Systems and calls management	☒	☒	☒	☐

Telix's user interface relies on Alt-key combinations to bring up the help screen, dialing directory, list of terminal emulations, chat facility, and protocol menus.

Among the assorted file-transfer protocols that *Telix* supports are ASCII, CompuServe Quick-B, Kermit, Modem7, Sealink, Telink, XModem, XModem 1K, YModem-batch, YModem-G, and ZModem. As a bonus, *Telix* offers space on its protocol menu for you to add four external protocols. It can support Erik Labs' external protocol BiModem (available in library 10 of CompuServe's IBMCOM forum) that allows you to send and receive files simultaneously. If you commonly use one protocol, *Telix* saves you time by defaulting to the last protocol you used. *Telix* also allows you to modify the built-in setups for ASCII, Kermit, and ZModem transfers.

A status window monitors file transfers in progress by displaying the bytes/blocks transferred, filename, transfer time, and a character-per-second efficiency rating. The program also alerts you when the file transfer is complete with a sound identical to the kind you hear when your modem has successfully connected with another system.

Telix's handy dialing directory can hold up to 1,000 entries; you can add as many directories as you want. Unlike some

products we reviewed, *Telix* does not include preset scripts for on-line services, although you'll probably find scripts on the very same BBS from which you downloaded *Telix*.

You can include information about the remote host in each dialing directory entry, including a default file-transfer protocol. The *Telix* FON editor you use to input information to the directory is cumbersome, however, and could use some refinement and added options. A better way to manipulate the *Telix* phone directory is by using the third-party shareware program *TFE (TelixFonEd)*. Version 2.20 is

Exis packs a lot of
solid features into
Telix—more than
you'd expect for \$39.



available in library 2 of IBMCOM under the filename TFE220.ZIP. It costs only a \$10 registration fee and formats the TELIX.FON file so that you can easily sort, add, and back up directory entries.

BATCH PHONE DIALING

Telix's batch processing of multiple phone numbers is a great help. If the first number you dial is busy or if you time-out, the program dials the next number you have previously selected. With a script, you



FACT FILE

Telix, Version 3.12

Exis Inc., P.O. Box 130, W. Hill, Ontario M1E 4R4, Canada; 416-289-4841.

List Price: \$39 registration fee.

Requires: 190K RAM (256K RAM recommended), DOS 2.1 or later. Hard disk recommended.

In Short: A very inexpensive, easy-to-use shareware program, *Telix* lacks support for some common terminal emulations but has many of the features and comprehensive script language of the more expensive communications packages.

CIRCLE 606 ON READER SERVICE CARD

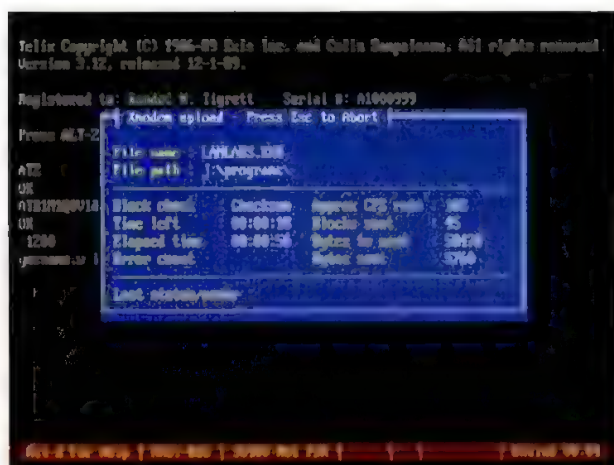
can set retries for one number before it goes on to the next. Many of the communications products we reviewed did not include a batch-processing feature.

Telix supports six terminal emulations: DEC VT52, VT102, and VT100, as well as ANSI, Avatar, and TTY. It unfortunately lacks support for the popular IBM 3101 and DEC VT220. You can also change terminal emulation mode to 50 by 80 lines in VGA, and 43 by 80 lines in EGA, a nice plus that gives you the ability to see extra lines on the screen. The calling host system has to support variable lines per page to take advantage of the VGA and EGA line mode.

The program's script facility, SALT (Script Application Language for *Telix*), is a fully functional programming language. If you are a C programmer, you will appreciate the similar feel of writing scripts in SALT. Because it's a compiled language, you execute scripts faster but lose flexibility in changing code more quickly. SALT has many followers on BBSs. You can find applications ranging from a smooth host-BBS emulation to file-directory utilities to auto-starting protocols.

In terms of performance, *Telix* could use some improvement. At 115.2 Kbps, it performed in the low midrange on the Character-based ZModem tests, but it fell behind at the slower speeds. It did about the same on the Professional YAM tests.

The company offers support through a BBS, with three lines running 24 hours a day. Help via the telephone is available during business hours. All in all, Exis packs a lot of solid features into *Telix*, much more than you might expect for your \$39.



Telix, a shareware program, displays a pop-up window during a file upload, continuously updating its report on the number of bytes sent, the number still remaining, and the time the transfer has taken. *Telix* also estimates the time remaining and the character-per-second rate.



To understand
the basic
principle behind
Fastback Plus,
tear out
this page
and destroy it.

LIKE A BOLT FROM THE BLUE,

your hard disk will eventually come crashing down. Manufacturers expect it. They even give hard disks an "MTBF" rating – the Mean Time Between Failures.

Before you lose your valuable data, back it up with Fastback Plus.

BACKUPS IN A FLASH With Fastback Plus, you can do things that DOS Backup never dreamed of. Like back up all your daily file changes in less than a minute. Or blaze through your entire hard disk at three megabytes a minute on 386 machines, or 10 megabytes in four minutes on an AT. It even formats your backup diskettes – automatically.

STRIKING SIMPLICITY Fastback Plus has three user levels – beginner, intermediate and advanced. Simple menus tell you how long your backup will take, and how many diskettes you'll need. And a unique data compression feature cuts the number of diskettes you need in half. You can even automate the entire process with one-touch macros.

DAZZLING SAFETY Only Fastback plus gives you reliable Advanced Error Correction. To illustrate, we punched a hole

larger than a .22 calibre slug right through a backup diskette – and retrieved all the data! That's security. And if you need help dodging even bigger bullets, our technical support staff will surprise you with its courtesy and ingenuity. Just call, and you're guaranteed same-day service.

GLOWING REVIEWS *PC Magazine* said it best in giving Fastback Plus its prestigious 1989 Editor's Choice Award: "Fastback Plus has virtually everything a backup program needs: top-speed performance, clear menus, every imaginable option, even a built-in macro program for automating complex tasks. A superb achievement."

A POWERFUL GUARANTEE Use Fastback Plus for 30 days, and if you're not completely satisfied, return it for a full refund. You have nothing to lose. And everything to save.

FREE PYRO For a limited time, get a FREE copy of Pyro!™, our popular screen-saving program just for writing "Pyro" on the Fastback Plus registration card before you return it. That's a \$49.95 value – free!

Call now for complete details and the dealer nearest you.

1 - 8 0 0 - 8 7 3 - 4 3 8 4





★ After Dark

(Berkeley Systems) After Dark prevents screen burn-in with over 35 fantastic displays and two level password protection. Use flying toasters or a logo as screen saving art, type in messages or set up slide show style presentation. The SystemIQ task manager maximizes performance while running After Dark. Features DOS blanking, even without Windows 3.0 **GR1094 \$29.**

★ PackRat 3.0

(Polaris) PackRat is a customizable information manager indispensable for the busy executive. PackRat makes it a snap to manage business and personal information of all types—names, phone numbers, telephone conversations and much more. Exchange information with Microsoft Word for Windows or Excel. Awarded PC Magazine's "Editor's Choice" and "Best of 1990." **BS2894 \$259.**



★ Excel for Windows 3.0

(Microsoft) With Excel for Windows, you'll create spreadsheets in a snap. Format worksheets automatically, sum numbers, create charts and perform much more all in a click of a button. Features automatic charting, cell formatting styles, 3-D charts, the option to add text and much more. Link and combine unlimited spreadsheets and format large worksheets into an outline to make browsing easier. **BS3254 \$309.**



★ CorelDRAW! 2.0

(Corel Systems) CorelDRAW! is the award winning PC graphics software that gives you incredible type control and superb drawing power in a value-packed program. Now, CorelDRAW! 2.0 comes with more drawing power and over 150 fonts; over 3500 clipart images and symbols; 31 import/export filters; an autotrace utility, a font conversion program and Mosaic, a visual file manager. **GR0543/5 \$369.**



★ Presentation Task Force

(New Vision Technologies) Clip art for those who mean business. Presentation Task Force contains 1,100 vector graphics in the popular CGM format, making it compatible with most PC charting, drawing and word processing programs. The collection has been designed for business, health care and military professionals, and is suitable for all types of color and black and white printers. **GR0823/5 \$105.**

★ Legacy

(NBT) Legacy provides all the features you need to create high-impact business documents. Designed specifically for Microsoft Windows 3.0, Legacy gives you all the features of a word processor, along with all you need in a desktop publisher. Mix text, graphics, images and data on the same page and view it on WYSIWYG display. **WP0534 \$298.**



NEW!

★ FileApps

(hDC Computer Corp.) At last, the file utilities Windows users have been waiting for! hDC FileApps is a set of five powerful MicroApps (pop-up utilities) that lets you perform essential file operations quickly and easily. You can delete any files, view your disk usage, search for files, encrypt files and share transfer files—all without ever leaving your Windows program. **UT1944 \$89.**

MicroWarehouse YOUR WINDOWS SOURCE!

AC1040	Powerbacker 360	219.
Maxell Disks (box of 10)		
ME0033	3 1/2" DS/DD (720k)	19.
ME0043	3 1/2" DS/HD (1.44Mb)	29.
Microref		
	Keyboard Templates (various)	Call.
Perma Power		
AC3340	SPS 500L	545.
Power Backups		
VE0050	Getting To Know Windows	19.
Sony (box of 10)		
ME0053	3 1/2" DS/DD (720k)	12.
ME0063	3 1/2" DS/HD (1.44Mb)	22.
Targus		
AC2340	Premier Leather Case	189.
AC0570/80	Leather Laptop Case	147.
AC0590/600	Nylon Laptop Case	54.
AC3360	Nylon Midsize Laptop Case	59.

DRIVES/CD ROM

Iomega		
DR0600	5.25" 44Mb Storage Cartridge	95.
DR0010	20Mb Cartridge	55.
DR1030	Bernoulli Box II Dual 44Mb Ext.	1965.
DR1180	Bernoulli Transportable	990.

ORDER 24 HOURS A DAY, 7 DAYS A WEEK!

Item numbers ending in 3 and 5 denote products available in 3 1/2" and 5 1/4" formats, respectively. Item numbers ending in 4 denote that both formats are included. Please refer to item numbers when ordering.

★ Windows-compatible products

COMPUTERS

ALR		
CP0013	ALR PowerFlex 286/40	1199.
CP0020	ALR 386SX 16 MHz PowerFlex	345.
Sharp		
CP0080	Wizard 8200	399.

MEMORY

Siemens/Samsung		
MY0009/2	DRAM 1Mb 80ns/100ns	8/7.
MY0005	SIMM 1Mb 70ns	65.
MY0013	SIMM 1Mb 100ns	74.
MY0010	SIMM 256K 100ns	25.

EXPANSION & UPGRADES

All Computer		
EX0870	All Charge Card with Adaptors	285.
ATI		
EX0795	VGA Wonder w/512K	239.
Comuter Elektronik Infosys		
EX1390	PS/1 2Mb Memory	249.
Creative Labs, Inc.		
EN0910	Sound Blaster	159.
Digital Vision		
EX1195	Computer Eyes Prof. Series	359.
InfoChip Systems		
EX1330	Expanz	135.
Intel		
EX1110	Co-Processor 80387SX	305.
EX0180	Co-Processor 80387-20	439.
EX0260	Inboard 386/PC - 1MB	505.

MEDIA & ACCESSORIES

BASF Disks (box of 10)		
ME0155	5 1/4" DS/HD (1.2Mb)	10.
CompuCase		
AC0360	Switch Box 2-Position	19.
Curtis		
AC2920	Command Center	89.
AC2330	Computer Tool Kit (52 pc)	45.
Kensington		
AC0140	Masterpiece Plus	109.

MicroSolutions		
DR1790	backpack 2.8Mb	279.
NEC		
CD0060	CD-ROM Portable CDR-35	439.
CD0100	Interface Kit (XT/AT)	144.
Pius Development		
DR1000	Hardcard II 80 (19ms)	589.
DR1250	105Mb Hardcard 2XL	699.
Solutions for Your PC/XT		
DR0960/70	3 1/2" 1.44Mb Floppy & Ctrl.	127.

PRINTERS & CARTRIDGES

Adobe		
PR1600	Adobe PostScript Cartridge	279.
PR1570/80	Adobe Type Cartridge	235.
PR1314	★ Adobe Plus Pack for PC	119.
AEG Olympia		
PR1750	NP80-24E Printer	329.
Canon		
PR1710	Auto Sheet Feeder for BJ-10e	72.
PR1510	BJ-10e Bubble Jet	339.
PR0460	Laser LBP8 Mark III	1579.
PR0640	LBP4 Laser	999.
Citizen		
PR0680	GSX-140 Color Printer	329.
Elite Business Apps		
PR1270	Charisma 25/Plus	299.
Insight Development		
PR1614	PrintAPlot	185.
UT1714	PrintTools	89.
Metro Software		
PR1304	PC Artifax	69.
Pacific Data Products		
PR0410	25 Cartridges in One!	265.
PR0910	Pacific 4 Memory w/ 2MB	159.
PR1280/90	Pacific Outlines I or II	205.
PR0920	Pacific Page Personal Edition 4.0	365.
Panasonic		
PR0390	KX-P1124 Dot Matrix	289.
QMS		
PR1720	PS410	2199.
Seiko Instruments		
PR0690	Smart Label Printer	175.

MODEMS & FAX BOARDS

Best Data		
MM0550	SmartOne 24/12 Modem	95.
MM0530	Smart One Fax9624 Int.	189.
MM0570	9632XL V.32 Ext.	555.

CIRCLE 225 ON READER SERVICE CARD

CHECK OUT OUR PRICES!

OVERNIGHT DELIVERY

Only \$7.00

Cardinal	
MM0510	★ 4800 SendFax Modem 105.
MM0770	9600 SendFax Modem 109.
Delrina Technology	
FX0123/5	★ WinFax 45.
Frecom	
FX0090	Frecom Fax 96 169.
Hayes	
FX0020	JT Fax 9600B 379.
MM0250	Personal Modem 2400 Plus 149.
MM0210	Ultra 9600 V.42 819.
CM0294	Smart Com Executive 75.
MM0060	SmartModem 2400 External 359.
Intel	
MM0330	2400B External 179.
FX0100	Satisfaxion Classic PC/XT 405.
PowerUser	
MM0630	Sendfax 24/48 75.
MM0640	Sendfax 24/96 89.
MM0680	Send/Receive fax 24/96 199.
MM0650	2400 Mini Ext. 89.
MM0670	2400 B Plus Int. 159.
Practical Peripherals	
MM0110	2400SA Ext. 185.
MM0160	PM2400SA Ext. w/ MNP Lvl.5 225.
Prometheus	
MM0700	ProModem 9600 Plus 696.
The Complete PC	
FX0060	The Complete Communicator 449.
FX0040	The Complete Fax/9600 450.
UDS/Motorola	
MM0360	FasTALK 9600 V.32/42b Ext. 489.
Zoom Telephonics	
MM0660	MX2400S w/9600 Sendfax 112.
MM0600	Modem V.42bis 2400 Ext. 199.
U.S. Robotics	
MM0200	Courier HST 9600 689.

INPUT DEVICES

Appoint	
IN0780	Mouse Pen 108.
Caere	
IN0984/94	The Typist (AT/PS/2) 419.
Calcomp	
IN0640	WIZ 149.
Fifth Generation	
IN0900	Logical Connection Plus 589.
Kensington	
IN0860/80	Expert Mouse (bus/ser) 124/109.
Kraft	
IN1080	Toptrak 72.
Logitech	
IN1070	Scanman 256 299.
IN0530	Scanman Plus 155.
Marstek	
IN1040	Mars 800 Scanner w/OCR 219.
IN2000	★ M-800W Hand Scanner 199.
IN2070	M-6000CG ColorArtist Scanner 499.
Microsoft	
IN0890/80	Mouse (bus/ser) 85.
IN0275/84	★ Mouse w/Windows (bus/ser) 145.

Shipping - Your choice:
Fast, dependable, overnight service - \$7 up to 7 lbs. Orders for in-stock items placed by 7:00pm ship same day. Ground service available - \$3 (same day shipping).

MicroSpeed	
IN0460/50	Trackball PC-Trac (bus/ser) 89/69.
MicroTouch Systems	
IN0810	The UnMouse 189.
Migraph	
IN1060	★ Color Scanner CS 4096 695.
Nisca	
IN1010	★ Niscan/GS for Windows 249.
Seiko	
IN1000	Seiko Digitizing Tab 3613 309.
Z-NIX	
IN1013/15	★ SuperMouse II (bus) w/Win 3.0 95.
IN1003/5	★ SuperMouse II (ser) w/Win 3.0 91.

MONITORS

Goldstar	
MT0140	14" Analog/VGA 349.
NEC	
MT0020	Multisync 2A 545.
MT0070	Multisync 3D 669.

ENTERTAINMENT & EDUCATION

Artworx	
EN2113/5	Bridge 6.0 27.
Banner Blue Software	
ED0444	Family Tree Maker 1.0 45.
Broderbund	
EN0734	Simcity 29.
EN0864	The Playroom 27.
ED0784	Where is Carmen S.D. Deluxe Ed. 49.
	Where is Carmen S.D. (various) ea.35.
Centron	
EN1073/5	Casino Master 41.
Electronic Arts	
IN1354	Life and Death 34.
Entertainment On Line	
EN2013/5	Lottery Tracker & Wheeler 25.
HyperGlot	
ED0913/5	Pronunciation Tutor (French) 59.
ED0903/5	Pronunciation Tutor (Spanish) 59.
ED0933/5	Word Torture (French) 25.
ED0923/5	Word Torture (Spanish) 25.
MECC	
ED0514/04	Word/Number Munchers ea.29.
ED0484	Oregon Trail 29.
MicroAce	
EN1384	Blackjack 39.
Microsoft	
EN1473/5	★ Entertainment Pack 29.
EN0043/5	★ Flight Simulator 4.0 45.
PC Globe Inc.	
BS1833/5	PC Globe 4.0 39.
BS1843/5	PC USA 2.0 39.

when you order from
MicroWarehouse

14 Great
Programs!

The POWER USER'S TOOL KIT 1.0

The MicroWAREHOUSE technical staff and the publishers of the popular POWER USER'S MANUAL have compiled a great new disk of utilities and applications...**THE POWER USER'S TOOL KIT.**

Fourteen great programs on one handy 5 1/4 inch disk*, including Active Life - a powerful time planner and scheduler for business or personal use, and IconDraw - a hot, new, Win3 utility for designing your own icons.

The POWER USER'S TOOL KIT is FREE from MicroWAREHOUSE when you order from us. If you want the disk, you pay only \$1.50 for shipping and handling. The programs are shareware, so you can try them free of charge. If you wish to continue using them, some authors ask that you pay a fee (\$10-\$150). Many are absolutely free. All of the details are explained on the disk, which is yours to keep. *Requires 1.2 MB High Density Drive.

FREE CATALOG!

We carry more than 1200 PC solutions including all the latest releases and updated versions. Just fill in the information requested below and we'll start your free, one-year subscription to the MicroWAREHOUSE catalog.

I'm Kerry, call me at:

MicroWAREHOUSE
1-800-367-7080
(1-800-DOS-7080)

Inquiries: 908-370-0518 Fax#: 908-905-5245
Order Toll-Free 24 Hours a Day, 7 Days a Week

Free Micro Warehouse Catalog Subscription
1690 Oak Street, P.O. Box 1590, Lakewood, N.J. 08701

Fill out and mail this coupon to receive a free, one-year subscription to the MicroWarehouse catalog.

Name _____
Address _____ Apt. _____
City _____ State _____ Zip _____

(Expect to receive your next issue within 4-6 weeks).

CIRCLE 225 ON READER SERVICE CARD



Total Word

(Volkswriter) Finally, a professional word processing program that's logical and easy to use so you can concentrate on your writing instead of your word processor. If you need to write memos, proposals, reports, scientific papers or the great American novel, Total Word delivers with the ease and flexibility you demand. Pull-down menus, context sensitive help: FREE SOFT FONTS, Spelling Corrector and Thesaurus integrated. **WF0133/5 \$209.**



M-6000CG ColorArtist Scanner

(Marstek) Marstek has combined color and true gray scale scanning technology together. Scan at 200 DPI and capture up to 262,144 colors in super color mode. In the mono mode, you can capture images at 400 dpi with 64 gray scales. Included is the RainbowArt, color/gray scale image processing software featuring multiple windows, support EMS and numerous file formats and much more. **IN2070 \$499.**

MICROWAREHOUSE CHECK OUT OUR PRICES!

DOSAmigos

© Francisco de Paula, Editor
The Bilingual Word Processor



West Cliff Software

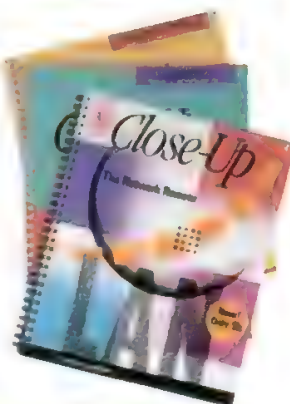
DOSAmigos

(West Cliff Software) DOSAmigos unites Spanish and English in a powerful word processing program. It includes full text formatting, pull-down menus, an on-line 40,000 entry English/Spanish, Spanish/English dictionary, the ability to type á é í ó ú ñ ç, and more. Proof your Spanish text using the 291,000 word Spanish spell checker. Supports WordPerfect, ASCII and other file formats. **WP1503/5 \$99.**

NEW!

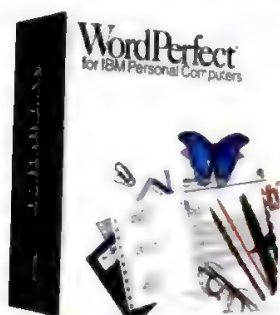
Close-Up Customer/Terminal & Support/ACS

(Norton-Lambert) Awarded PC World's Best Buy, Close-Up connects two PCs at any location by modem. Customer/Terminal lets you remotely view and control any single or networked PC running Support/ACS. Access DOS, run any program, enter data, transfer files, call into bulletin boards. Runs jobs automatically. To view and control multiple PCs on your network, use Close-Up/LAN. **CM0143/5 \$129. Support/ACS CM0153/5 \$159. Close-Up LAN CM0434 \$550.**



WordPerfect 5.1

(WordPerfect Corp.) WordPerfect version 5.1 comes complete with new, innovative features to provide you with even greater flexibility. Bold new features include pull-down menus, mouse support, tables, an equation editor and extensive graphics printing support. Includes some elements of page layout software with its ability to print multiple columns, and to import and size graphics. **WP0363/5 \$249.**



Definitions Plus!

(WordScience) The electronic version of the 795 page American Heritage Dictionary from Houghton Mifflin, helps you write better, faster; enhances word processing and productivity. Pops up inside character based word processors, spellcheckers and thesauruses. Detailed examples and usage notes let you know you're using words correctly. Needs only 4K of RAM. **WP0493/5 \$69.**



WealthStarter

(Reality Technologies) Take your first steps toward financial success with WealthStarter. Define your goals and WealthStarter will help you reach them by setting up a system for saving and investing. Features include: a Financial Report Card, expert feedback to help you cut your taxes and manage your money and powerful graphing capabilities. Used with Quicken, WealthStarter will energize your data. **FN0334 \$35.**



Spinrite II 1.1

(Gibson) Spinrite, a unique collection of disk utilities, optimizes your hard disk's Sector Interleave Factor, ensuring that data transfers take place at your system's optimum rate. Removes errors from your hard disk, detects surface defects and relocates data to safe areas. Realigns your hard disk and operates on DOS partitions of any size. **UT0874 \$45.**



UnMouse

(MicroTouch Systems, Inc.) Use the most intuitive pointing device ever designed—your own finger. Introducing the UnMouse by MicroTouch. One million touch points and a touch sensitive glass tablet respond instantly to your touch. Unique templates allow you to execute function keys directly from the tablet. Also featuring truly outstanding graphics capabilities. **IN0810 \$189.**

Software Toolworks

ED0594	US Atlas	45
Sphere Inc.		
EN0194	Tetris	23
Toyogo		
EN1464	Nemesis Go Master Deluxe	95
Visionary Software		
EN1413/5	Synchronicity 2.0	36

DESKTOP PUBLISHING & GRAPHICS

Adobe	Adobe Fonts (various)	Call
	★ Adobe Type Manager	55
PR1594		
Aldus		
GR2053/5/4	★ PageMaker 4.0	489/535
ArtRight		
GR0613/5	★ Image Portfolio Vol. 1	110
GR0623/5	★ Image Portfolio Vol. 2	110
	★ Image Portfolio (various)	85
Atech		
BN0014	★ Pub Powerpak w/free Bundle	55
AutoDesk		
GR0904	★ AutoDesk Animator	263
Berkeley Systems		
GR1994	★ After Dark	29
Bitstream		
GR1494	★ FaceLift for Windows	58
GR1844	★ FaceLift for WordPerfect	59
Broderbund		
GR1564	★ New Printshop	35
GR0064	★ New Printshop Companion	29
Caere Corporation		
GR1984	★ Omnipage 386 3.0	479
Computer Associates Int'l		
GR1823/5	★ CA Cricket Graph 1.2	139
GR1833/5	★ CA-Cricket Presents 1.2	319
Corel Systems		
GR0543/5	★ CorelDRAW! 2.0	369
Custom Applications		
GR1943/5	★ Freedom of Press Light 2.5	55
hDC Computer Corp.		
BS3114	★ Icon Designer	35
Icom Simulations		
GR1854	★ Intermission	35
Micrografix		
GR1293/5	★ Designer 3.01	469
GR1773/5	★ Charisma	344
Microsoft		
BS2304	★ Powerpoint for Windows	319
New Visions Technology		
GR0823/5	★ Presentation Task Force	105
Power Up Software		
GR0884	★ Express Publisher 2.0	89
Software Publishing		
GR0083/5	★ Harvard Graphics 2.3	319
Timeworks		
GR0554	★ Publish-It! 1.2	135
WordPerfect		
GR1194	★ DrawPerfect	269
Xerox		
GR1574	★ Ventura Pub Gold 3.0 iWin	549
Z-Soft		
GR0634	★ PC Paintbrush IV Plus	115

CAD PRODUCTS

American Small Business Co.		
CA0023/5	Design CAD 3D 3.1	206
CA0013/5	Design CAD 4.2	156
AutoDesk		
CA0173/5	Autosketch 3.0	146
Computer Easy		
CA0153/5	Dream House Professional	47
Foresight Resources		
CA0124	★ Draftix Windows CAD 3.0	439
Generic Software		
CA0074	Generic CADD 5.0	235
MathSoft		
CA0114	MathCAD 2.5	309

BUSINESS

Abacus		
UT1684	★ Becker Tools	48
Absolute Solutions		
FN0284	★ Computerized Classic Acct.	259
Application Techniques		
BS0204	★ Pizazz Plus	65
asd Software, Inc.		
BS2754	★ Plansoft 2.5	139
Ashton Tate		
BS0773/5	dBASE IV 1.1	489
Avery		
GR0804	Label Pro	49
Bell Atlantic Corp.		
UT0914	★ Thinix	323
Bloc Publishing		
BS0044	Form Tool Gold	58
Borland International		
BS0214	Paradox 3.5	519
BS3044	Quattro Pro 2.0	329
Buttonware		
BS2094	PC File 5.0	99
Central Point Software		
UT1794	Central Point Backup	59
UT0854	PC Tools Deluxe 6.0	89
Chronologic Corp.		
UT0584	Instant Recall	62
Chronos		
BS2184	Who What When 2.0	169
Compuserve		
CM0074	CompuServe Membership Kit	21
Contact Software Int'l		
BS1064	ACT! 2.0	225
Crosstalk Communications		
CM0284	Crosstalk Communicator	65
CM0193/5	★ Crosstalk for Windows 1.1	129
CM0033/5	Crosstalk MK IV 2.0	150
CM0043/5	Crosstalk XVI 3.71	130
DacEasy Inc.		
FN0014	Dac Easy Accounting 4.1	85
FN0024	Dac Easy Bonus Pak 4.1	129
Dariana Technology		
UT1894	System Sleuth Analyzer	45
UT1904	System Sleuth Pro	85
UT1704	★ Win Sleuth	79
DataEase International		
BS1904	DataEase 4.2	476
Dataform Tech.		
CM0424	Procomm Plus 2.0	65
Delrina Technology		
BS0853/5	PerFORM Designer & Filter 2.1	99
BS2604	★ PerFORM PRO	269
Delta Technology		
UT0724	Direct Access 5.0	65
Dynamic Microprocessor Assoc.		
CM0173/5	pcAnywhere IV	99

MICRO WAREHOUSE®
1690 Oak Street, P.O. Box 1590 Lakewood, N.J. 08701
©1991 Micro Warehouse Inc.

- Visa and Mastercard accepted
- If our credit card will not be charged until your order is shipped
- Purchase orders subject to credit approval
- All products covered by 120 day ltd warranty
- *Defective software replaced immediately
- Hardware replaced or repaired at our discretion
- CT residents add 6% sales tax N.J. and Ohio residents add appropriate sales tax
- Orders for in-stock items placed by 7:00 p.m. (E) weekdays (barring system failure, etc.) ship overnight by Airborne Express. (Some areas require an extra day)
- Shipping charge \$7 per order up to 7 lbs \$1 per lb above 7 lbs
- UPS ground service also available upon request - \$3 per order
- UPS orders placed by 3:00 p.m. (E) weekdays ship same day
- Actual freight charges apply for computers, hard disks, Bernoulli's, tape back ups, monitors and UPS printers
- Alaska, Hawaii, outside continental U.S. APD/FPO call for information
- Item availability and price subject to change without notice
- Software is not copy protected except where marked by asterisk
- We reserve the right to limit quantities
- Please indicate disk size

MicroWAREHOUSE 1-800-367-7000



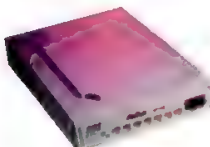
Blackjack
(MicroAce) Learn the strategies of Blackjack at home! Just choose the strategy you wish to master, set the rules and begin to have fun. Evaluates your plays and strategy errors and records them for your review. **EN1384 \$39.**



ACT! 2.0
(Contact Software) Manage all of your miscellaneous data with ACT! 2.0. Features an appointment diary, address book, form letter and report generator and a word processor with a spelling checker. **BS1064 \$225.**



Masterpiece Plus
(Kensington) Combine power line and phone line protection in one control center that fits under your monitor on a detachable swivel base. Awarded PC Magazine's "Editor's Choice". **AC0140 \$109.**



FastTALK V.32/42b
(UDS/Motorola) PC Magazine's "Editor's Choice." High speed 9600 bps communication. V.42 error correction for 100% reliable transmissions. V.42 bis and MNP5 Datacompression. Throughputs up to 38.4 Kbps. **MM0360 \$489.**



Sound Blaster
(Creative Labs Inc.) Add better sound to your favorite games with Sound Blaster. Offers a sampler for digitizing live sounds and a built in 4 Watt/Channel amplifier. Compatible with the C/M/S software library, Game Blaster and AdLib. **EN0910 \$159.**



Power User 24/96 SendFax

(PowerUse, Inc.) This internal combination fax/modem gives you all the features in the Power User 24/48 SendFax, but provides 9600 bps Send-Only fax capabilities. Includes ProComm communication software and Faxdit. It's truly a low cost solution for high-speed

fax transmissions. **MM0640 \$89.** Also available is **24/48**

SendFax. MM0630 \$75 and 24/96 Send/Receive Fax. MM0680 \$199.

Easy Automation		
BS3033/5	Form Type	159.
EllaShim Microcomputers, Inc.		
BS3243/5	VirusSafe	55.
Enable Software		
BS0893/5	Enable O/A	429
BS1803/5	Enable BP	119/129.
FastTrax International		
IN1110	FastTrax	49.
Fifth Generation		
UT0124	Fastback Plus 2.10	115.
Formwork Corp.		
BS2524	Form Publisher for Windows	149.
Fox Software		
BS0705	Foxbase + Dev. System 2.10	189.
BS1795	FoxPro	455
BS2024	FoxPro LAN	649.
Funk Software		
BS0624	Sideways 3.3	59.

Merril & Bryan		
UT1854	Turbo EMS 6.0	56.
Microcom		
CM0083/5	Carbon Copy Plus 5.22	115.
Micro Logic		
BS2144	InfoSelect	56.
Microsoft		
BS3254	Excel for Windows 3.0	309.
BS2723/5	Office for Windows	649.
BS2733/5	Productivity Pack	42.
BS2704	Project for Windows 1.0	449.
BS2523/5	Windows 3.0	90.
BS1954	Windows Developer's Tool Kit	319.
WP0043/5	Word 5.5	205.
WP0374	Word for Windows 1.1	309.
BS0173/5	Works 2.0	95.
Multisoft		
PC-Kwik Power Pak 2.0		70.
NBI, Inc.		
WP0554	Legacy	298.

A Micro Warehouse Exclusive!

Norton Utilities 5.0 with Netroom Bundle

(Symantec/Helix) Norton Utilities 5.0 features tools for data recovery, optimizing hard disks, security and systems diagnostics. Repair damaged files, unerase accidentally deleted files and make damaged disks bootable. All this in a MicroWarehouse exclusive bundle with Netroom. Winner of PC Magazine's Editor's Choice Award, Netroom is a full featured memory manager which works on all 8088 through 486 PC's. Frees all RAM occupied by LANS, device drivers and TSR's by moving them into extra memory. **BN0024 Save \$30 with our special price. \$134.**



GeoWorks		
OP0064	GeoWorks Ensemble	125.
Gibson Research		
UT0874	Spinrite II 1.1	65.
Great American Software		
FN0264	Money Matters	51.
FN0215	One-Write Plus Acct. System	170.
hDC Computer Corp.		
UT1944	FileApps	69.
UT1634	FirstApps	49.
UT0644	Windows Express 3.0	49.
Helix		
BS3154	NetRoom Single User	49.
BS3134	NetRoom 4 User	91.
Hewlett Packard		
BS2783/5	New Wave 3.0	160.
Hilgraeve		
CM0064	Hyper Access/5 1.1	125.
Informix		
BS2283/5	Wingz for Windows and OS/2	329.
Inner Media, Inc.		
UT1754	Wide Angle	85.
Inset Systems		
UT1614	HiJaak 2.0	99.
Intuit		
FN0164	Quicken 4.0	37.
Iris Associates		
BS0914	3 for 3	84.
Jacoby & Myers Law Offices		
BS2923/5	WillPower	32.
Lifetree		
BS3104	Correct Grammar 3.0	59.
Lotus		
BS3174	Agenda 2.0	288.
GR0864	Ami Pro 1.2	305.
BS1473/5	Lotus 1-2-3 Rel. 2.2	339.
BS2433/5	Lotus 1-2-3 Rel. 3.1	419.
BS2323/5	Symphony 2.2	519.
Meca		
FN0243/5	Managing Your Money 7.0	129.

Nolo Press		
BS0124	Willmaker 4.0	36.
Norton-Lambert		
CM0143/5	Close-Up Customer/Terminal 3.0	129.
CM0434	Close-Up LAN	550.
CM0153/5	Close-Up Support/ACS 3.0	159.
Okna Corporation		
BS3124	Desk Top Set	85.
Peachtree Software		
FN0233/5	Peachtree Complete III	145.
FN0253/5	Peachtree Cmpl. III Bonus Bdl	219.
Polaris		
BS2894	PackRat 3.0	259.
Precision Software		
BS1874	Superbase 4 Windows	419.
Prisma Software		
UT1044	Your Way	119.
Prodigy		
CM0264	Prodigy Startup Kit	29.
QMS		
BS1624	Ultrascript PC Plus	279.

PC-Cillin Virus Immune System

(Trend Micro Devices) PC-Cillin immunizes your computer against over 70 known viruses and protects against newly developed viruses. Deletes infected files before installing, stays in your system to prevent any virus infections and safekeeps the boot sector's data for use in emergencies. Menu driven, built in self checking and more. **UT1964 \$99.**

NEW!



Qualitas		
UT0683/5	386Max Professional 5.1	75.
Quarterdeck Office Sys.		
BS0163/5	DESQview 2.3	79.
BS1043/5	DESQview 386 2.3	135.
UT0743	QEMM 50/60 5.1	59.
EX1103/5	QEMM 386 5.1	61.
Que Software		
WP0544	RightWriter 4.0	59.
Reality Technologies		
FN0124	Wealthbuilder 1.1	139.
FN0334	WealthStarter	35.
Reference Software		
WP0334	Grammatik IV 1.0	52.
WP0514	Grammatik Windows	55.
Softlogic Solutions		
UT0073/5	Disk Optimizer 4.05	39.
Software Directions		
UT1914	Print Q 5.0	85.
UT0884	PrintQ LAN	259.
Software Products International		
BS2863/5	Access SQL	949.
BS2873/5	Open Access	425.
Software Publishing		
WP0463/5	Professional Write 2.2	165.
Spinnaker Software		
BS1923/5	BetterWorking Eight-In-One	35.
BS1134	The Resume Kit	29.
Symantec		
BS0653	Q&A 3.0	235.
UT1694	Norton AntiVirus	84.
UT0054	Norton Util. Advanced 5.0	115.
UT1604	The Norton Backup 1.2	95.
BS2113/5	Timeline 4.0	472.
Symantec/Helix		
BN0024	Norton Util. w/ Netroom Bundle	134.
ThreadZ Software Design Group Inc.		
UT1804	ThreadZ File F/X	75.
Timeslips Corp.		
BS0133/5	Timeslips III 4.0	189.
Touchstone		
UT0734	Check It! 3.0	85.
Traveling Software		
UT0394	Laplink III	89.
Trend Micro Devices		
UT1964	PC-Cillin Virus Immune System	99.
TriSoft		
UT1733/5	Whereabouts Deluxe	59.
Vertisoft		
UT0904	Double Disk	65.
VolksWriter		
WP0133/5	Total Word	209.
WestCliff Software		
WP1503/5	DosAmigos	99.
WordPerfect Corp.		
WP0363/5	WordPerfect 5.1	249.
WP0504	LetterPerfect	125.
WordScience		
WP0483/5	Definitions Plus	69.
WordStar U.S.A.		
WP0634	WordStar Legacy	269.
XTree Company		
UT1874	XTree Pro Gold 2.0	95.

LANGUAGES

Asymetric		
LN1454	Toolbook	299.
Borland International		
LN0023/5	Turbo C++	135.
LN0153/5	Turbo C Prof. ++	199.
Microsoft		
LN0074	C Compiler 6.0	319.
LN0043/5	QuickC 2.5	69.
Nantucket		
LN1444	Clipper 5.0	519.
Solution Systems		
LN0433/5	Brief 3.0 for DOS	179.
Spinnaker Software		
LN1464	Spinnaker Plus	279.

CIRCLE 225 ON READER SERVICE CARD

WinComm, Version 1.4

by Sara Parker

Promoted by Synappsys as the communications package for *Microsoft Windows* 3.0, the \$149 *WinComm* is a useful prod-

COMMUNICATIONS ASYNCHRONOUS

uct, offering options such as DDE support, password security for local operations, and mini-BBS features, but it is not without drawbacks. While one of its most interesting features is its ability to operate at speeds above 19.2 Kbps, that can also

be one of its least effective.

Terminal session parameters in *WinComm* allow you to set transmission rates ranging from 300 to 115,200 bits per second. Rates in the other *Windows* communications products we reviewed were limited to speeds of 19,200 bps. *WinComm* bypasses the *Windows* communi-

COMMUNICATIONS WITHOUT ZMODEM: Old Standards and a New Favorite

by Sara Parker

Four widely used communications products did not fit our review criteria because they lack the ZModem protocol, but their popularity and reputation are reason enough to give them consideration. Digital Communications Associates' \$195 *Crosstalk XVI*, Version 3.71, Hayes Microcomputer Products' \$249 *Smartcom III*, Version 1.2, Microcom's \$299 *Relay Gold*, Version 4.0, and Software Ventures Corp.'s \$295 *MicroPhone II for Windows*, Version 1.01, offer some advanced features but also cost more than most products we reviewed.

Crosstalk XVI, *Smartcom III*, and *Relay Gold* not only remain popular communications products, they represent standards in the industry. *MicroPhone II for Windows*, released in July 1990, does not enjoy as long-standing a history in the DOS environment as the others, but it's a popular communications package in its PC-based *Windows* version and its Macintosh version.

All of these general-purpose communications programs share similar file-transfer capabilities and include a variety of modems on their setup menus. DCA released *Crosstalk XVI* in 1983 and has continually enhanced and upgraded it through the years. It prompts you to enter commands and is not as user-friendly as DCA's other communications products, but in many respects it holds its own against its competitors.

Hayes provides *Smartcom III* with a strong script language. *Smartcom III* has great potential in the corporate world because the scripts you create in it can be used in the less expensive *Smartcom Exec*. This feature allows users to share their powerful scripts with others whose packages lack some script statements.

Relay Gold has been on the market since 1983. Its strong points include 3270 terminal emulation and easy con-

nection to many popular on-line services. Its advanced communications features make it a powerful product, but not one recommended for novices. It's not as easy to use as some products we reviewed, and its price tag may prove prohibitive. *Relay Gold* appeals to corporate users with a need for a total communications package that supports mainframe connections.

MicroPhone II for Windows furnishes possibly the best script-language inter-

Even without
ZModem, these four
comm packages
bear consideration.

face of all the *Windows* packages we reviewed. It contains a few minor flaws that need addressing, such as lack of DDE support, and fewer terminal emulation types and file-transfer protocols than many of its *Windows*-based competitors. Nevertheless, it offers one of the easiest user interfaces.

FILE TRANSFERS AND TERMINAL EMULATION

File-transfer capabilities make up a large part of the communications picture. *Crosstalk XVI* file transfers aren't complicated, but they are limited by the program's support for only a handful of protocols: Kermit and Super Kermit, XModem (CRC and checksum), and the proprietary *Crosstalk* protocol. File-transfer protocols in *Smartcom III* don't differ drastically from *Crosstalk XVI*. They include Kermit, XModem,

YModem-batch, and YModem-G.

MicroPhone II provides XModem, XModem 1K, YModem-batch, and YModem-G protocols, among others, while *Relay Gold*'s protocols include Kermit, XModem (CRC and checksum), YModem-batch, YModem-G, and the proprietary *Relay* protocol. *Relay Gold* offers one important feature that the other two character-based products don't—the ability to perform background file transfers. This feature can be a real timesaver.

Many buyers of communications products consider terminal emulation an important feature. *Crosstalk XVI* can emulate eight different terminals, including ANSI, IBM 3101, and VT100. In contrast, *Smartcom III* and *MicroPhone II* both support only ANSI, DEC VT52 and VT100, and TTY. Because connecting to mainframes is *Relay Gold*'s forte, it provides a substantial list of terminal emulation types, including DEC VT52, VT100, VT220, and VT240, as well as IBM 3101 and 3270, Telex, and TTY.

SCRIPT COMPARISON

The script languages in these packages can create scripts to perform any function from logging on to on-line services to automatically transferring multiple files in your absence.

Crosstalk XVI includes built-in scripts for such services as CompuServe, Dow Jones News/Retrieval, and MCI Mail, but creating scripts with this program can be cumbersome. *Smartcom III*'s very powerful script language, SCOPE (Simple Communications Programming Environment), is useful for automating frequently used commands. It permits advanced operations, letting you instruct a script to modify its steps depending on the way the remote system responds.

The script language in *MicroPhone*

CONTINUES

Any bill. Any bank. Anywhere. Any questions?



Finally, an electronic payment system that responds to all your bill-paying needs. **CheckFree®**

Imagine using your personal computer to pay your bills faster and easier than ever before, without the hassles of checks, envelopes, and stamps. Think what it would be like to pay all your bills and do all your recordkeeping with just a few keystrokes in just minutes per month. Now you can, with CheckFree, from Checkfree Corporation—the nation's leader in electronic payments.

Making payments with CheckFree is simple. Just pick the dates you want your bills to be paid, specify the amounts, and your software sends the information via modem to the CheckFree Processing Center. Fixed, recurring bills such as your mortgage can be paid automatically.

Many payments can be sent electronically from your account to their destination. Checks or laser-printed drafts are sent to individuals or companies not yet linked to electronic funds transfer networks.

With CheckFree, you don't have to switch banks, and you can pay any individual or company in the United States. That's because your payments are cleared through the Federal Reserve System, the same system that clears your checks today.

All CheckFree transactions are automatically recorded by the software and documented in your bank statement. Non-CheckFree transactions can be entered easily; and all your records, as well as specific reports of your finances, can be accessed through a few simple commands. (And that's especially helpful at tax time.) Plus, you can export CheckFree data to TaxCut® and any spreadsheet compatible with Lotus 1-2-3®.

CheckFree is also seamlessly integrated into Quicken®, Managing Your Money®, and Checkwrite Plus®. So you can enjoy CheckFree's automation with any of these leading financial software products.

Any questions? We have the answers. Call our toll free number right now. Any comments? Here is what the experts say: "CheckFree makes bill paying a quick, painless task rather than a monthly ritual to be dreaded..."—**PC Magazine**. "I said I'd try it, but I wasn't sure I'd like it. I like it."—Chris Shipley, **PC Computing**.

Any doubts? If you don't agree that CheckFree software delivers a faster and easier way to pay your bills, we'll refund



CheckFree® software is available at leading retailers and direct order dealers including Egghead Discount Software®, Electronics Boutique®, Babbages®, Waldenssoftware®, Software Etc., Soft Warehouse®, Radio Shack®, Best Buy®, Price Club®, Sam's Warehouse Club®, PC Connection®, MacConnection®, MicroWarehouse®, MacWarehouse®, and CompuAdd®.

your money.* So don't waste any more time (or checks or envelopes or stamps). Get CheckFree today.

CheckFree software is available at retail stores, or by phone for \$29.95 plus \$4 shipping and handling. CheckFree service is only \$9.95 per month for your first 20 payments, then \$3.50 per each additional ten payments or portion thereof. That's not much considering the time you save and hassles you avoid. Plus your first month of service is free.

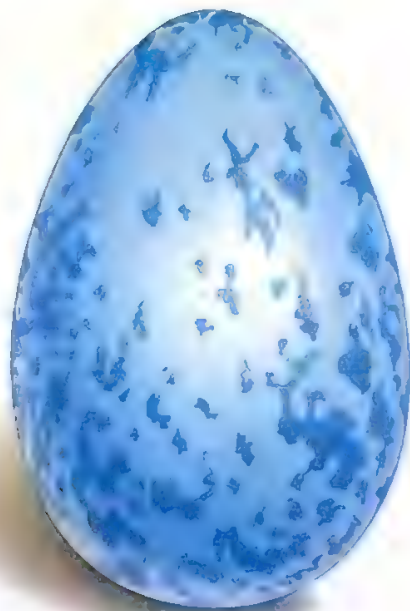
Call **1-800-882-5280**

CheckFree®

Hardware Requirements: IBM® PC/Compatibles with 512K RAM, MS DOS® 2.1 or higher, two floppy drives or a hard disk system, or Apple Macintosh® 512KE or higher 800K drive—and a Hayes® compatible modem.

CheckFree is a registered trademark of Checkfree Corporation. All other trademarks are the property of their respective corporations.

*Money back guarantee on software valid for direct orders only, return within 30 days of purchase for a full refund.



— EFFICIENT DESIGN —

Birds, turtles, crocodiles — just as the egg is nature's most efficient design for delivering complex life systems, DTK's KEEN-3300 Series is the ideal 386 computer with which to build your network or multi-user system. As a fileserver, networkstation or standalone system, its unique write-back cache (64KB/256KB) and competitive price make it one of the most cost-efficient, high-speed systems available.

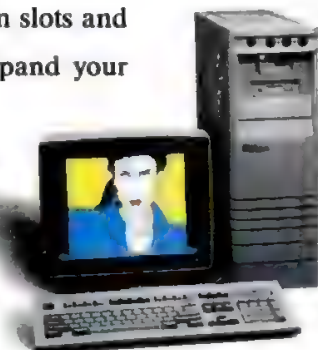
HIGH DEPENDABILITY

Over 100 full-time design and manufacturing engineers work together to ensure that dependability is "built-in." Then, QC personnel scrutinize every DTK motherboard and system to the most stringent standards in the industry. Over 2,000,000 satisfied customers testify to our reputation for quality and dependability.

GROWTH POTENTIAL

Like the egg, the basic KEEN-3300 is merely the beginning. Its 16 MBytes of high-speed RAM, 8 expansion slots and 7 drive bays (server) provide the flexibility you need to expand your system as your requirements grow.

The KEEN-3300 — a powerful beginning at a price that won't crack your budget. Call for the dealer nearest you, DTK Computer Inc., (818) 333-7533. 15711 E. Valley Blvd., City of Industry, CA 91744. Fax: (818) 333-5429.



See us at Comdex Spring 91



A reputation for success.

CIRCLE 102 ON READER SERVICE CARD

CITY OF INDUSTRY, CA
(818) 333-7533

SAN JOSE, CA
(408) 436-6363

HOUSTON, TX
(713) 568-6688

ELK GROVE VILLAGE, IL
(708) 593-3080

EDISON, NJ
(201) 417-0300

MIAMI, FL
(305) 477-7440

DTK is a trademark of Datatech Enterprises Co., Ltd. 80386 is a trademark of INTEL Corp. ©DTK Computer Inc., 1990.

cations driver to set up the UART directly for speeds higher than the 19.2 Kbps that driver supports. You should use caution when selecting the higher speeds. Since neither the driver nor the program activates the FIFO buffer on the 16550A UART, and since the CPU may be busy with other *Windows* tasks, it is possible

Old Standards and a New Favorite

CONTINUED

II includes a feature called Watch Me. This enhanced learning feature accepts outside intervention and allows you to change the learned script on the fly. Watch Me also makes it easy to choose other options you want performed during the execution of a script.

MicroPhone II contains the same script language as its Macintosh counterpart, making the program useful in corporations using a split PC/Macintosh environment. Scripts might need a little tailoring to move between environments, but overall they're portable. *MicroPhone II* ships with pre-programmed scripts, including ones for CompuServe, BIX, Dow Jones News/Retrieval, GENie, and MCI Mail.

EASE OF USE

Installing each package proved simple. Each of the four products contains a dialing directory of sorts. The dialing directories in *MicroPhone II* and *Smartcom III* are easy to use, but the interfaces for the *Relay Gold* and *Crosstalk XVI* directories are not as well-designed.

For all of *Relay Gold*'s strong points, its user interface is a notable limitation. You use the function keys to select menu items, which makes for an irritating communications session.

Smartcom III benefits from a design that has been tailored to work efficiently with Hayes modems. It supports the Hayes V-series Ultra Smartmodem 9600 and takes advantage of the speed and data protection capabilities of the Hayes Enhanced Serial Port (ESP). Depending on your PC's capabilities, *Smartcom III* automatically supports DTE (Data Terminal Equipment) computer-to-modem speeds of up to 38.4 Kbps. The DTE speed allows your system to make full

use of the V.42bis data compression capabilities in the Hayes modem. It would be even better if *Smartcom III* supported the 57.6-Kbps DTE speed possible in new V.32bis modems.

The lack of ZModem support is one strike against all these products, and in many cases, you might expect to get more features or better user interfaces for these top-end prices. (*MicroPhone II for Windows*, Version 2.0, which was slated to ship by the time you read this, will be a welcome upgrade; the company said the new version would support the ZModem protocol and Dynamic Data Exchange, among other features.) But for some users—especially those for whom price is no object—these packages' advantages may outweigh their weaknesses. Their sales show they still fill many needs. ■

Crosstalk XVI, Version 3.71

Digital Communications Associates Inc., 1000 Alderman Dr., Alpharetta, GA 30202-4199; 800-241-4762, 404-442-4500.

List Price: \$195. **Requires:** 160K RAM, DOS 2.1 or later.

CIRCLE 618 ON READER SERVICE CARD

Smartcom III, Version 1.2

Hayes Microcomputer Products Inc., 5835 Peachtree Corners East, Norcross, GA 30092; 404-441-1619.

List Price: \$249. **Requires:** 512K RAM, DOS 2.0 or later.

CIRCLE 619 ON READER SERVICE CARD

Relay Gold, Version 4.0

Microcom Inc., 500 River Ridge Dr., Norwood, MA 02062; 800-822-8224, 617-551-1000.

List Price: \$299. **Requires:** 192K RAM, DOS 2.0 or later.

CIRCLE 620 ON READER SERVICE CARD

MicroPhone II for Windows, Version 1.01

Software Ventures Corp., 2907 Claremont Avenue, Berkeley, CA 94705; 415-644-3232.

List Price: \$295. **Requires:** 640K RAM, *Microsoft Windows* 2.x or 3.0.

CIRCLE 621 ON READER SERVICE CARD

COMMUNICATIONS ASYNCHRONOUS

that computers on the receiving side of a fast stream of data will drop bits, resulting in numerous retries and an overall lower throughput for the communications link. When we tested *WinComm* at higher speeds between two PCs with the 16550A



WinComm, Version 1.4

Synappsys, 401 W. Main St., #300, Norman, OK 73069; 405-366-6363.

List Price: \$149.

Requires: 340K RAM, *Microsoft Windows* 3.0.

In Short: Its script language is too complex, but *WinComm* is a solid communications package that combines a good graphical interface with a midrange price.

CIRCLE 608 ON READER SERVICE CARD

UART, it actually showed lower throughput than when we selected 19.2 Kbps. At 19.2 Kbps, it performed on a par with the other *Windows*-based products.

File transfers in *WinComm* are as simple as in most *Windows* communications packages because the *Windows* environment lets you pick and choose options quickly and easily. Among the file-transfer protocols supported are CompuServe B, Kermit, XModem, XModem 1K,

SUITABILITY TO TASK

WinComm

Mini and mainframe connections	☒	☒	☒	☒
Automated information retrieval	☒	☒	☒	☒
Systems and calls management	☒	☒	☒	☒

YModem-batch, YModem-G, and ZModem. To monitor file transfers, a horizontal bar graph shows the percentage completed next to the block count, error count, transfer status, bytes per second, and time remaining. If you minimize *WinComm* during a file transfer, an icon appears showing the filename and remaining time for file-transfer completion. When it finishes transferring the file, *WinComm* sounds an alarm to alert you to check back in on your session.

FILE PREVIEW

While in *WinComm*, you can easily view your file transfers and modem setup through a simple tool called Monitor. Monitor shows the ASCII characters as they are received and transmitted. It also shows you the status of Data Carrier

She's 5 years old.
She's already had
7 names,
16 identities and
21 homes.



Ad
Council

Every year thousands of children are kidnapped by their own parents. Beginning the tragic ordeal of life on the run. Child Find offers an end to the running. With our toll-free number and our mediation program, we offer a way out for the parents and for the kids.

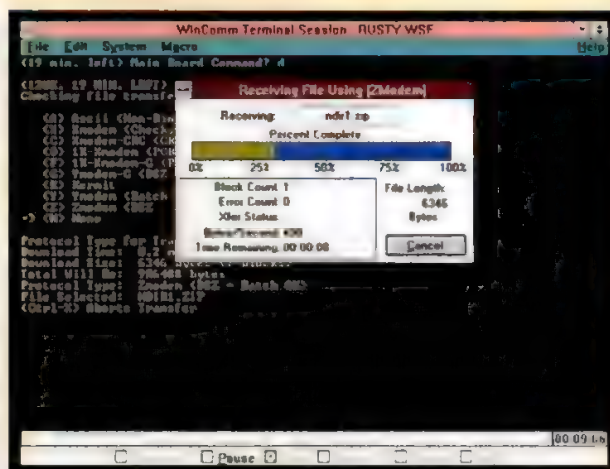
For us, it's a labor of love. But unfortunately, we can't operate on love alone.

To find out how you can help, or if you need our help, please call 1-800-A-WAY-OUT. And help another child find a more peaceful future.



CHILD FIND OF AMERICA INC.

COMMUNICATIONS ASYNCHRONOUS



WinComm works under Windows, displaying a colorful bar graph that progressively indicates the percentage of a file transfer completed, along with an estimate of the amount of time remaining before it finishes.

Detect, Request to Send, and Clear to Send signals. Another option allows you to view the data in hex while it's being transferred.

WinComm offers security features like password protection. Its host features, like

**The scripts included
in WinComm are
useful, but it's helpful
to have programming
experience before
tackling its complex
script language.**

many of the other programs, allow you to set up a type of mini-BBS with several privilege levels available to callers. Additionally, WinComm supports interrupt 14h extended calls for communications, allowing it to access modems over some networks.

WinComm supplies ANSI, Compu-Serve Vidtex, and DEC VT52 and VT102 terminal emulation types, but it lacks any IBM 3101 or DEC VT220 or 320 support. This is unfortunate; Windows communications products are rapidly gaining popularity in the corporate environment, where these standards are often in use.

The scripts included in WinComm are

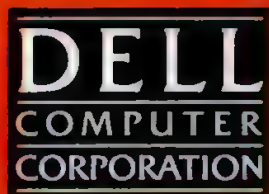
useful, but the script language is more difficult than those of the other Windows products. It's helpful to have some previous programming experience before taking the plunge into this complex language. A learning feature of sorts comes in handy when all you want to do is automate your communications sessions. The start recorder option creates an automatic script, recording keystrokes and the session information from your host connection. After you have compiled this macro, you can edit the commands, or customize the script.

WinComm is the only product reviewed that requires numeric result codes from the modem. You send the modem a simple AT command (ATV0) to make it reply in numbers instead of using complete words like "CONNECT." The action is trivial, but the software won't work properly without it.

WinComm ships with one 3.5- and one 5.25-inch disk, along with a straightforward user guide and reference. Synappsys provides free technical support at a toll number. This product is certainly worth investigation by Windows users, although they should be careful about operating it at speeds higher than the Windows communications driver supports. ■

Mike Byrd is a frequent contributor to PC Magazine. Sara Parker has experience in technical support and user training. She specializes in software systems. Joe Salemi is a frequent contributor to PC Magazine. Barry Simon is a contributing editor of PC Magazine. Randol Tigrett is workgroup systems project leader at PC Magazine LAN Labs.

WARNING COMPAQ OWNERS: Exposure To The Following
Pages May Cause High Blood Pressure, Loss Of Sleep, And
Severe Depression.



TOUGH ACT TO FOLLOW.

Getting more computer for less money is always a good idea. But with today's tight budgets, it's absolutely ingenious.

Just check out the new Dell® 325P. It has a full 25 MHz 386™ DX CPU for better performance than the SX in the Compaq system. There's an optional 32K RAM cache that can boost performance an additional 20%. And it's backed by a service package that's won an unprecedented 8 PC Week Corporate

TO ORDER, CALL
800-388-1730
FOR FAST PROCESSING, PLEASE REFERENCE 1006
HOURS: 7 AM - 9 PM CT, M-F; 8 AM - 4 PM CT, SAT
IN CANADA, CALL 800-367-5757

Satisfaction Polls.

All for up to
\$1,500 less than

a similarly configured Compaq system.

Now that should cure your recession depression.

Finally, a poll with reliable information.

Now a bit more about those 8 Corporate Satisfaction Polls. One poll category we dominated is the one called "reliability"—maybe because Dell computers are designed, built and tested under the same roof. And nothing leaves the building until we're sure everything works like it's supposed to, when it's supposed to.

Then you get up to 30 days to use it.

If you aren't completely satisfied, send it back.



THE DELL 325P 386 25 MHz
SYSTEM INCLUDES VGA COLOR PLUS MONITOR, 80 MB HARD DRIVE, 2 MB RAM.

THE NEW DELL SYSTEM® 325P 25 MHz 386.

Standard Features:

- Intel® 80386 microprocessor running at 25 MHz.
- Page mode interleaved memory architecture.
- Standard 1 MB of RAM,* expandable to 16 MB on the system board.
- Integrated VGA controller with 1024 x 768 support with optional Dell 256K video RAM kit.
- Integrated hard drive and diskette drive interface.
- Optional 32 KB SRAM cache.
- Socket for Intel 80387 math coprocessor.

- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
 - 3 full-sized 16-bit AT expansion slots available.
 - High-performance IDE 40 MB, 80 MB, 100 MB, 190 MB, and 320 MB hard disk drives.
 - 1 parallel port, 2 serial ports, PS/2 compatible mouse port, all integrated.
 - 85 watt power supply.
 - 12-month On-Site Service Contract.
 - Optional i486 microprocessor upgrade card running at 33 MHz.
- 40 MB VGA Color Plus System \$2,499
Price listed includes 1 MB of RAM.*
80, 100, 190 and 320 MB hard drive configurations also available.

*Performance Enhancements: Within the first megabyte of memory 96 KB of memory is reserved for use by the system to enhance performance. Can be optionally disabled. All prices and specifications are subject to change without notice. Dell cannot be responsible for errors in typography or photography. †Source: From the Compaq Computer Corporation price list effective February 11, 1991. **Payment based on 36-month, open-end lease. ‡Leasing arranged by Leasing Group, Inc. In Canada configurations and prices may vary. Dell and Dell System are registered trademarks of Dell Computer Corporation. Intel is a registered trademark and 386 and 486 are trademarks of Intel Corporation. Other trademarks and trade names are used to identify the entities claiming the marks and names or their products. Dell Computer Corporation

TOUGH ACT TO SWALLOW.



COMPAQ DESK PRO 386s/20 386SX 20 MHz
SYSTEM INCLUDES VGA COLOR MONITOR, 60 MB HARD DRIVE, 2 MB RAM.
ACTUAL DEALER PRICES MAY VARY.

We'll return your money, no questions asked.

If something goes wrong, it won't wreck your day.

But just for the sake of argument, let's suppose something does go wrong with your Dell computer.

Just call the Dell toll-free technical hotline. We can solve 90% of all problems, often in 6 minutes or less.

If it can't be solved over the phone, a trained technician will come to your home or office the next business day with the solution in hand.^Δ

But if you just can't wait, don't.

TechFax offers relief for insomniacs.

Say you're pulling an all-nighter and need help. Dell has pioneered a service called TechFax. Anytime, 24 hours a day, you can pick up the phone and call the Dell technical library on our automated TechFax line. Detailed information on your Dell system will be faxed right back to you automatically.

And all this coverage, including a full year of field service, comes at no additional cost.

When your needs change, your computer can too.

Dell offers a number of ways to easily upgrade your system. Including a 33 MHz i486™ processor card to give you the hottest chip on the block. Which means you can get

a new computer without getting a new computer.

For sale, for lease, for less.

You can stretch your money even further with the most comprehensive credit, lease[◊] and lease-to-buy plans in the industry. So call us. Or talk to someone selling Compaq systems. But be careful not to choke on the price.



disclaims any proprietary interest in trademarks and trade names other than its own. ^ΔService provided by Xerox Corporation. On-site service may not be available in certain remote locations. Shipping, handling and applicable sales tax not included in the price. For information on and a copy of Dell's 30-Day Total Satisfaction Guarantee limited warranty, and Xerox's Service Contract, please write to Dell USA Corporation, 9505 Arboretum Boulevard, Austin, Texas 78759-7299. ATTN: Warranty. ©1991 Dell Computer Corporation. All rights reserved.

TURBOCHARGED.

Compaq has a peculiar proposition for you.

When their servers are configured similarly to Dell's, they want to charge you up to \$12,500 more for them.

That's bad enough in normal times, but with the tight budgets these days it's ridiculous.

The New Dell Drive Array gives performance a boost. With Dell Drive Array, we've overcome the two big problems that plague most servers: Slow disk subsystem performance, and the difficulty of ensuring data integrity.

Let's tackle slow performance first:

The Dell Drive Array is based on the Intel® 80960 RISC processor. And, depending on the application, can deliver twice the storage I/O performance of a stand alone ESDI drive.

Allowing more users to access the server more

quickly for
greater pro-
ductivity.

TO ORDER, CALL
800-388-1720

FOR FASTER PROCESSING PLEASE REFERENCE #11868
HOURS: 7 AM-9 PM CT M-F 8 AM-4 PM CT SAT
IN CANADA CALL 800-387-5752

As for ensuring data integrity, the Dell Drive Array uses parity checking techniques. So a single disk can guard all the data on up to 4 other disks.

What's more, the Dell Drive Array also uses a standard high performance SCSI software interface. Instead of Compaq's proprietary interface. Which means you can get up and running in just about every operating environment, without requiring special device drivers.



\$15,099

LEASE: \$572/MONTH**

THE DELL® 433TE, 33 MHz i486™ SERVER

1 ARRAY, 5 200 MB HARD DRIVES, 8 MB OF RAM, 128 KB CACHE

THE DELL SYSTEM® 433TE 33 MHz i486 EISA AND THE DELL SYSTEM 425TE 25 MHz i486 EISA.

STANDARD FEATURES:

- i486 microprocessor running at 33 MHz (433TE) or 25 MHz (425TE) with 8 KB internal cache.
- 128 KB external cache (433TE).
- Standard 4 MB of RAM* expandable to 64 MB (eight internal SIMM sockets, each accepting a 1 MB, 2 MB, 4 MB or 8 MB SIMM, installable in matched pairs).
- Socket for WEITEK 4167 math coprocessor.
- 11 internal half-height drive bays.
- Eight 32-bit EISA expansion slots (six EISA master slots and two EISA slave slots).
- High-performance IDE (80 MB, 100 MB, 190 MB and 330 MB) ESDI or SCSI (330 MB, 650 MB) hard disk drives.
- SmartVu™ — Advanced systems diagnostic display.
- 12 month On-Site Service Contract.

VGA Color Plus System with Array of 5 200 MB hard drives

433TE, 8 MBRAM* 33 MHz
425TE, 8 MBRAM* 25 MHz

\$15,099
\$13,199

The Dell Systems 433TE and 425TE are class A devices sold for use in commercial environments only. *Performance Enhancements: Within the first megabyte of memory 384 KB of memory is reserved for use by the system to enhance performance. The 433TE is photographed with optional extras. All prices and specifications are subject to change without notice. Dell cannot be responsible for errors in typography or photography. **Source: From Compaq Computer Corporation 2/11/91 price list. **Payment based on 36-month, open-end lease. Leasing arranged by Leasing Group, Inc. In Canada configurations and prices may vary. Dell and Dell System are registered trademarks and SmartVu is a trademark of Dell Computer Corporation. Intel is a registered trademark and i486 is a trademark of Intel Corporation. UNIX is a registered trademark of AT&T in the U.S. and other countries. Other trademarks and trade names are used to identify

OVERCHARGED.



\$27,698*

ACTUAL DEALER PRICES MAY VARY.

COMPAQ SYSTEMPRO 486/33, 33 MHz i486 SERVER
1 ARRAY, 4 210 MB HARD DRIVES, 8 MB OF RAM, 512 KB CACHE

Maintaining servers can be beyond Compaq dealers.

If a server goes down, your whole company can go down.

With a Compaq system, you may have to trust the dealer who sold it to you to fix it. With Dell, you deal directly with us, the company that designs and manufactures your servers.

Which means you'll be working with a telephone support staff that solves 90% of all problems over the phone. Generally in 6 minutes or less.

And because Dell is an AT&T UNIX® source code licensee and validates compatibility under Novell and Banyan, you can be sure your Dell technician knows quite a bit about networking too.

But on those rare occasions we can't solve your problem over the phone, a trained service technician will come to your office with a solution in hand.△

Dell has even pioneered a new 24-hour TechFax line which automatically faxes you detailed information about your Dell System from the Dell technical library.

And all this coverage, including a full year of field service, comes at no additional cost to you. Pretty good for a service package that won eight PC Week Corporate Satisfaction Polls.

There's a lot more to know when you buy a server. From the first moment you call

Dell, and for as long as you own your system, we'll work with you and answer any questions—from service and technical issues or the wide variety of credit, lease or lease-to-buy plans available.◊

So if you're looking for a server that will soup-up your network without blowing your budget, call Dell.

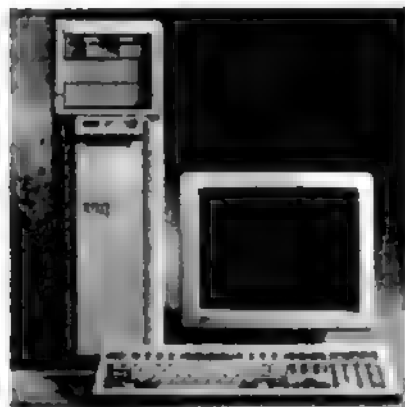
Unless, of course, you like being overcharged and underserved.



the entities claiming the marks and names of their products. Dell Computer Corporation disclaims any proprietary interest in trademarks and trade names other than its own. △Service provided by Xerox Corporation. On-site service may not be available in certain remote locations. Shipping, handling and applicable sales tax not included in the price. For information on and a copy of Dell's 30-day Total Satisfaction Guarantee, limited warranty, and Xerox's Service Contract, please write to Dell USA Corporation, 9505 Arboretum Boulevard, Austin, Texas 78759-7299 ATTN: Warranty © 1991 Dell Computer Corporation. All rights reserved.

CIRCLE 474 ON READER SERVICE CARD

HARDWARE FOR



THE EISA-BASED
DELL SYSTEM® 433TE.
WAS \$9,399

NOW ONLY \$8,899

Lease \$322/month**

• i486™ microprocessor running at 33 MHz with 128 KB external cache.
100 MB VGA Color Plus System \$8,899
Price listed includes 4 MB of RAM.* 80, 190, 330 and 650 MB hard drive configurations also available.
25 MHz systems also available at \$6,649.



THE EISA-BASED
DELL SYSTEM 433E.
WAS \$8,399

NOW ONLY \$7,899

Lease \$286/month**

• i486 microprocessor running at 33 MHz.
100 MB VGA Color Plus System \$7,899
Price listed includes 4 MB of RAM.*
80, 190, 330 and 650 MB hard drive configurations also available.

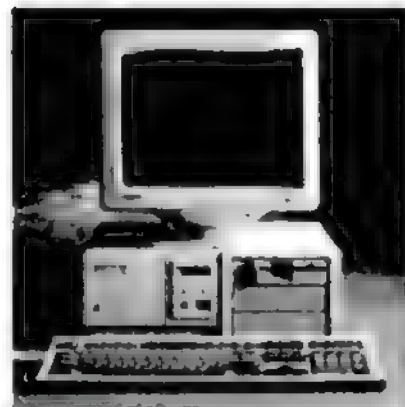


EISA-BASED
DELL SYSTEM 425E.
WAS \$6,399

NOW ONLY \$6,099

Lease \$221/month**

• i486 microprocessor running at 25 MHz.
100 MB VGA Color Plus System \$6,099
Price listed includes 4 MB of RAM.*
80, 190, 320 and 650 MB hard drive configurations also available.



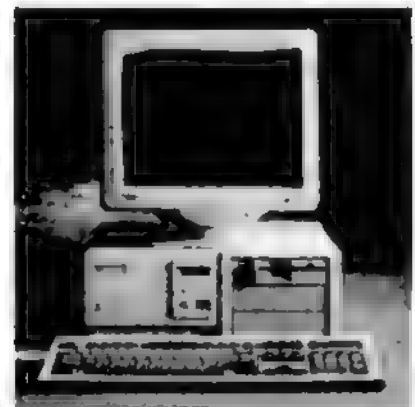
THE
DELL SYSTEM 333D.
WAS \$4,099

NOW ONLY \$3,699

Lease \$135/month**



• Intel® 80386 microprocessor running at 33 MHz with 64 KB external cache.
40 MB VGA Color Plus System \$3,699*
Price listed includes 4 MB of RAM.*
80, 100, 190, 330 and 650 MB hard drive configurations also available.



THE
DELL SYSTEM 325D.
WAS \$3,499

NOW ONLY \$3,299

Lease \$120/month**



• Intel 80386 microprocessor running at 25 MHz with 32 KB external cache.
40 MB VGA Color Plus System \$3,299
Price listed includes 4 MB of RAM.*
80, 100, 190, 330 and 650 MB hard drive configurations also available.

Whether you call it negative growth, a recessionary pause or a complete disaster, one thing's clear—this is not the time to be spending more than you have to on computers.

Which is why Dell is lowering prices up to \$900 on selected computers. From our turbocharged servers to the PC Magazine Editors' Choice 386™ systems.

But even with these bottom line prices you still get Dell's top of the line service.

Personalized personal computers.

Because we actually manufacture the desktop computers we sell, each one is custom configured to your personal

specifications. With a virtually limitless number of choices of monitors, hard drives, RAM sizes and peripherals.

Then we run a configured systems check, and ship it to you via two-day air standard. With a 30-day money back guarantee and a one-year limited warranty.

Less money doesn't mean less

service. The Dell service and support package has won an unprecedented 8 PC Week Corporate Satisfaction Polls.

Maybe that's because Dell users get a technical support staff that can solve 90% of all problems over the phone.

Usually in 6 minutes or less. An electronic bulletin board that lets you see other users' questions. And more importantly,

TO ORDER, CALL
800-388-1760
FOR FASTER PROCESSING PLEASE REFERENCE #11BE9
HOURS: 7 AM-9 PM CT M-F 8 AM-4 PM CT SAT
IN CANADA, CALL 800-387-5752

The Dell System 433TE and 425TE are class A devices sold for use in commercial environments only. *Performance Enhancements: Within the first megabyte of memory, 128 KB (316SX, 320LT, 316LT and 210) 96 KB (333D and 325D) and 384 KB (320LX, 425E, 433E, 425TE and 433TE) of memory is reserved for use by the system to enhance performance. Can be optionally disabled on 333D, 325D, 316SX and 210. All systems are photographed with optional extras. All prices and specifications are subject to change without notice. Dell cannot be responsible for errors in typography or photography. **Payment based on 36-month, open-end lease. *Leasing arranged by Leasing Group, Inc. In Canada, configurations and prices may vary. Dell and Dell System are registered trademarks and 425E is a trademark of Dell Computer Corporation. Intel is a registered trademark and 386 and 486 are trademarks of Intel Corporation. Other trademarks and trade names are

HARD TIMES.



THE
DELL SYSTEM 320LX.
WAS \$2,799

NOW ONLY \$2,499

Lease \$94/month**

• Intel 80386SX microprocessor running at 20 MHz.

40 MB VGA Color Plus System \$2,499

Price listed includes 1 MB of RAM.*

80, 100, 190, 330 and 650 MB hard drive configurations also available.



THE
DELL SYSTEM 316SX.
WAS \$2,099

NOW ONLY \$1,999

Lease \$75/month**



• Intel 80386SX microprocessor running at 16 MHz.

40 MB VGA Color Plus System \$1,999

Price listed includes 1 MB of RAM.*

20, 80, 100 and 190 MB hard drive configurations also available.



THE
DELL SYSTEM 320LT.
WAS \$3,599

NOW ONLY \$3,499

Lease \$127/month**

• Intel 80386SX microprocessor running at 20 MHz.

20 MB, 1 MB RAM* \$3,499

40 and 120 MB systems also available.



THE
DELL SYSTEM 316LT.
WAS \$2,999

NOW ONLY \$2,899

Lease \$109/month**



• Intel 80386SX microprocessor running at 16 MHz.

20 MB, 1 MB RAM* \$2,899

40 and 120 MB systems also available.



THE
DELL SYSTEM 210.
WAS \$1,899

NOW ONLY \$1,799

Lease \$67/month**



• 80286 microprocessor running at 12.5 MHz.

40 MB VGA Color Plus System \$1,799

Price listed includes 1 MB of RAM.*

20, 80 and 100 MB hard drive configurations also available.

Dell's answers.

They even have anytime, any day access to Dell's innovative TechFax line. Just dial-up to get detailed information from the Dell technical library faxed back. Automatically.

But if the problem just can't be solved over the phone, a trained service technician will come with a solution the next business day.^Δ

And best of all, there's no need to worry about budgeting for all this. Because the system price includes on-site service for a year, and phone support forever.

Stretch your budget and get all the credit. To loosen those tight budgets even more, you can take advantage of

the most comprehensive credit, lease and lease-to-buy programs in the industry.[◊]

For instance, you can lease Dell computers for as little as \$56 a month. Or use the lease-to-buy plans and own the computer at the end of the lease term.

There's even a Dell Direct Advantage MasterCard with up to \$15,000 credit limit and a way to earn points toward Dell products with everything you buy. So call Dell right away. Because the best way to save money is to stop wasting it.



used to identify the entities claiming the marks and names of their products. Dell Computer Corporation disclaims any proprietary interest in trademarks and trade names other than its own. ^ΔOn-site service provided by Xerox Corporation and may not be available in certain remote locations. Shipping, handling and applicable sales tax not included in the price. For information on and a copy of Dell's 30-day Total Satisfaction Guarantee, limited warranty, and Xerox's Service Contract, please write to Dell USA Corporation, 9505 Arboretum Boulevard, Austin, Texas 78759-7299, ATTN: Warranty. © 1991 Dell Computer Corporation. All rights reserved.

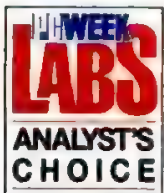
CIRCLE 532 ON READER SERVICE CARD

"DynaComm is an example of what a great Windows program is all about."

-PC Week - Product Review

The word is out. On January 28, 1991, three asynchronous communications programs written specifically for Microsoft Windows 3.0 were reviewed by PC Week Labs. The analysts' choice was unanimous. For number of terminal emulations, ease of data transfers, quality of documentation, effective use of Windows interface, price relative to performance, and ease of installation and configuration, FutureSoft's™ DynaComm® was the hands-down winner.

"Beginning users will appreciate how easy DynaComm is to use, and the slick, ready-to-use interfaces it has for many on-line services. Experts and communications consultants should value its DDE capabilities and the ability to hide any trace of DynaComm from the user."



DynaComm 3.0
January 28, 1991

DynaComm's powerful script language allows you to do everything from automating frequent tasks for remote services to creating custom front-end applications for main-frame day-to-day activities which take full advantage of the Windows interface. DynaComm can also access other Windows applications through its script language using Dynamic Data Exchange (DDE) or Dynamic Link Library access (DLL).

DynaComm also supports Window's Multiple Document Interface (MDI), and the built-in text editor supports up to eight open documents at

one time. Along with the standard mouse and keyboard support, DynaComm allows up to 32 user-definable function keys for each settings configuration, and offers file transfers in X, Y, and ZModem, Kermit, Yterm and CompuServe B+ protocols. Supported emulations include DEC VT-220, AT&T 605/705, Hewlett Packard 700/94, Data General 470C, DEC VT 52 and

VT 100, IBM 3101, TeleVideo 925/950, CompuServe and ADDS Viewpoint/60. LAN support includes NetBios, Ungermann-Bass, DEC LAT and support for modem pools.

To anyone considering asynchronous communications software, the PC Week Analyst's Choice said it best. For ease of use, powerful scripting language and more, only one package warrants serious consideration - DynaComm.

Call now for a free DynaComm Demo Diskette.



DynaComm®

FutureSoft

1001 South Dairy Ashford, Suite 101
Houston, TX 77077
1-713-496-9400, or (FAX) 1-713-496-1090



DynaComm is a registered trademark of FutureSoft Engineering, Inc. FutureSoft is a trademark of FutureSoft Engineering, Inc. All trademarks are the property of their respective holders.
CIRCLE 128 ON READER SERVICE CARD

TO
THE
LIMIT

Caching The 386SX/20

Add
processor

RAM cache to an

entry-level 386SX/20

and you approach 386DX/

25 territory—in price more

than performance. PC Labs tests

nine cached small-footprint SX/20s.

by Bill O'Brien Intel advertises its 80386SX chip as the CPU that finally provides fast and inexpensive 32-bit computing for offices and households alike, and that claim is not without foundation. Indeed, as the majority of SX-based computer vendors gain the all-important FCC Class B rating for their machines, a smart buyer, keeping in mind this computer's entry-level nature, can get set up for light office or home computing and manage to save a sizable sum in the process. But the trick is to avoid crossing the price-versus-performance boundary that separates SX and DX computing.

COMPUTERS

20-MHz 386SX PCs

OPPORTUNITY COST

Although the 80386SX chip has the same 16-bit external address and data buses as the 80286 chip, it shares the 32-bit internal features of the higher-powered 80386 (80386DX), enabling it to run operating systems and software currently available for the 386DX and 486DX. And since ISA-bus DX-based machines use the same 16-bit I/O slots as SX machines, the SX's 16-bit connection to the bus is not a limiting factor.

From a market standpoint, the SX allows Intel to supply a processor chip that can be used in an entry-level computer while freeing Intel from its contests with clone makers who were also providing competitively priced, competitively performing 80286 processors.

But monopoly is an uneasy game. With Intel the only supplier, the SX chip debuted in July 1988 at \$189 per 1,000—a cost nearly four times as great as that of the chip the SX was supposed to supplant, the 80286. The effect of this pricing was so devastating that the first time *PC Magazine* discussed 386SX computers ("The 80386SX Gets a Jump Start," May 30, 1989, page 240), only nine machines were in production. Compared with the 80386DX and 80486DX, with initial production rates of a dozen or more computers, the 80386SX got off to a flying stop.

Three months later there was more to look at—but not much more; only 14 machines were available for review ("Out in Force: 14 Machines with the SX Promise," August 1989). From a manufacturer's standpoint, it was advantageous to put the less expensive, fast 80286 chips into low-end systems.

THE 16-BIT CONNECTION

A 50 percent price cut in the cost of the SX chip finally sparked enough interest that by the beginning of 1990 a veritable tidal wave of 31 new 16-MHz SX computers were ready for review ("386SX: The New Corporate Standard," January 30, 1990). Mail-order suppliers would gladly ship you an SX-based computer with 1MB RAM and a 40MB hard disk for around \$2,200—although the increased demand caused chip shortages and consequent delivery delays. Nevertheless, on the average, that \$2,200 price point was only \$200 to \$500 more than a similarly

equipped 12-MHz 80286-based PC, the hot machine at the time. The availability of an 80386SX-based computer at this price effectively sounded the death knell of the 80286.

The secret to keeping the price down was in the configuration. Because the SX chip retains the same 32-bit internal architecture as its DX cousins and, like the 80286, it talks to its bus only 16 bits at a time, vendors could take existing 80286 system configurations and graft the SX into them. Component pricing for disk drives, video boards, and monitors also dropped at the same time, bringing the price of SX systems into line with their slower cousins.

When we looked at the 16-MHz SX just before the introduction of a faster 20-MHz version ("The Cheapest 386SXs Ever," August 1990), we chose a more powerful system configuration (including 2MB of RAM and a 60MB hard disk) so that the SXs we tested would make ideal entry-level machines for the newly upgraded *Windows* environment. Despite their increase in work potential, thanks to a decrease in peripheral pricing we were able to find 21 machines that fit the bill for \$1,850 or less (after applicable dealer discounts).

MORE MHz, MORE SPEED, MORE MONEY

The 20-MHz version of the SX hit like a tornado with 40—count 'em, 40—production units reviewed in the November 27, 1990, issue of *PC Magazine* ("20-MHz 386SXs: The New Entry-Level Machines"). Typically stocked with 2MB of RAM and 60MB to 100MB hard disks, this SX group cost an average of \$2,600. Compared with the low cost of 16-MHz SX computers, that figure hardly represented entry-level pricing. Aside from the initial higher cost attached to new processors and the larger hard disk, processor RAM cache was largely responsible for the extra price increment.

At 16 MHz, it was still feasible to use only dynamic RAMs and maintain a viable performance profile. But at 20 MHz, even 70-nanosecond DRAMs could not eliminate the wait states required for the processor to access memory. And although there is nothing inherently wrong with a

wait state in a low-end computer, twelve of the manufacturers had decided to compete instead with machines based on 20-MHz 80386DX processors.

To achieve the system performance necessary for competition with the full-scale 32-bit chip, SX motherboard designers chose to use static memory arranged as processor RAM cache, and this added cost.

The 12 machines introduced with processor RAM caches averaged \$3,000, \$400 above the average \$2,600 price for 20-MHz SXs. But based on *PC Magazine* Labs' benchmark tests, the performance gain was obvious. For a 15 percent price increase over noncaching SX computers, you could enjoy a 10 percent improvement in the speed of basic processor and memory functions.



INTERIOR CONFIGURATION KEY

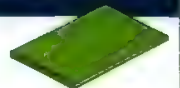
CASE

Cases typically come in five sizes: full desktop, full-height small-footprint (shown here), half-height small-footprint, tower, and mini-tower. All cases in this review have a footprint smaller than 17 by 17 inches.



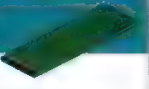
MOTHERBOARD

In this roundup, all motherboards are small-footprint size.



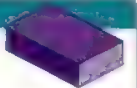
EXPANSION BOARD SLOTS

In these diagrams, all slots are represented by full-size boards.



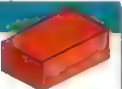
POWER SUPPLY

Power supply options fall into four categories: large (shown here), medium, small, and long and narrow.



DRIVE BAYS

Drive bays typically come in four different sizes: full-height (shown here), half-height, one-third-height, and 3.5-inch size.



ZEOS[®]
386SX.



“With
so much
going for it,
how could you
go wrong?”

— *PC Magazine*



You Simply Can't Go Wrong!

"The ZEOS 386SX-16 successfully combines the two things people most want in their systems: solid performance and attractive pricing... The ZEOS is the fastest SX tested."

*PC Magazine, On why the ZEOS
386SX Wins Editor's Choice.*

Starting complete at only \$1,295 the ZEOS 386SX will be your choice too. Come on in and take a look!

award winning ZEOS 386SX for only \$1295? After all, there are *no compromises* in this system. Quite frankly, a great price is the result of many ZEOS advantages.

For instance. Unlike most of the others, ZEOS maintains its own chip level Research and Development staff *plus* our own board level manufacturing facilities. All right here in St. Paul. When it comes with the ZEOS® name it comes with World Class Quality. It's the best you can buy.

You are saving too because you are buying direct from ZEOS. And you can buy with confidence because ZEOS is a strong and rapidly growing public company (NASDAQ Symbol: ZEOS). Our professional Systems Consultants and expert Technical Support staff serve tens of thousands of customers World Wide, twenty four hours a day. And these are happy customers. How do we know?

Because nearly 50% of our system sales comes from

Price Support.

previous ZEOS customers. Now that's incredible! But that won't surprise you

after you buy your first ZEOS system. You'll be back too.

ZEOS 24 HOUR A DAY SUPPORT.

It was ZEOS who invented 24 Hour Tech Support and is it ever good! Anytime you need help your telephone is a Toll Free Hotline direct to your own personal technician—

one who knows your system inside and out. We're here if you need us. Toll Free, Around the Clock, Every day. No additional charge.

And that's only the start of your ZEOS Customer Satisfaction Package.

Add to it our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Parts Replacement Policy. You're going to be very satisfied. We don't just say it. *We Guarantee it.*

RELEASE 5.0!

Conventional Memory
0.49
0.83
0.83

ORDER YOUR OWN ZEOS 386SX TODAY!

Ordering your ZEOS 386SX is easy. Simply pick up the phone and give us a call at 800-423-5891. Buying the ZEOS 386SX is perhaps the best purchase decision you'll ever make! After all, your satisfaction is absolutely *Guaranteed.*

ORDER NOW TOLL FREE:

800-423-5891

DON'T FORGET THE OPTIONS!

As *PC Magazine* said, ZEOS offers "more options than even the most configuration hungry hound could possibly need." Because every ZEOS system is custom built you may choose from a huge selection of hard drives, video packages and many other options. On-site service is available too. Call 800-423-5891 for details.

YOUR COMPLETE ZEOS 386SX HARD DRIVE SYSTEM INCLUDES ALL OF THESE FEATURES FOR ONLY \$1295!

20 MHz Systems Available Too!

- Intel® 80386SX-16 CPU. 8/16 MHz Dual Speed, Keyboard selectable, Reset/Turbo Buttons.
- Fast 42MB IDE Hard Drive, 1.2MB Teac® floppy drive.
- 512K of high speed memory expandable to 16MB.
- ZEOS 14" flat screen High-Res amber monitor, Tilt and Swivel Base. Includes Genuine Hercules® brand graphics controller!
- ZEOS/RS Enhanced keyboard with pleasant Tactile/Click feel.
- Two high speed serial ports plus parallel and game ports.
- Six 16-bit and two 8-bit expansion slots, driven by the best power supply money can buy.
- Speed demons appreciate our Shadow RAM/EMS capability, and full 387SX support.
- Includes our 7-bay ZEOS space saver case with two cooling fans for added reliability. Top notch.
- Plus your ZEOS Absolute Satisfaction 30 Day Money Back Guarantee, Full One Year Limited Warranty and Express Replacement Parts policy.
- Wrap it all up with 24 Hour a Day Toll Free Technical and Sales support on your ZEOS Hotline. You've got a winner!

ORDER NOW TOLL FREE:

800-423-5891

Fax Orders Dial: 612-633-1325

In Minnesota Call: 612-633-4591

Hearing Impaired (TDD):

800-228-5389

Government Orders:

800-245-2449

Outside U.S./Canada: 612-633-6131

MasterCard, VISA, Discover,

AmExp, Z-Card and COD.



TAKE YOUR PICK!

Choose from 4 great money saving packages.

or specify your own custom configuration!

The Complete ZEOS 386SX, Package #1. Your complete 386SX system!

ONLY \$1295

This is your complete 386SX system for only \$1295. It includes all the features described in the column to the left. System highlights include:

- Screaming ZEOS 16MHz 386SX motherboard.
- Ultra-fast 42MB IDE Hard Drive.
- Genuine Teac® 1.2MB floppy.
- 512K of High Speed 60ns DRAM, 16MB capacity.
- Shadow RAM/EMS capability, 387SX support.
- ZEOS 14" Flat Screen Tilt/Swivel Amber Monitor.
- Genuine Hercules® Graphics Card.
- Two Serial, one Parallel and one Game Port.
- ZEOS SuperCase: 2 Cooling Fans, 7 Bays, 200 Watt power supply.
- ZEOS R/S 101 keyboard.
- 30 Day Absolute Satisfaction Money Back Guarantee.
- One Full Year Limited Warranty, with Express Parts Replacement.
- 24 Hour a Day Toll Free Technical Support.

The Incredible Upgrade Package #2

ONLY \$1895

We take Package #1 and upgrade your Editor's Choice system to include:

- Top quality 16-bit high res 1024 VGA color graphics card with 512K video RAM.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt & Swivel.
- One full Megabyte of 60ns DRAM.
- Microsoft® DOS 4.01 with Disk Cache Software.



**PC Magazine
said it best.
"Great expandability,
quality parts, and
down-to-earth
pricing...the
result is a winner!"
— Editor's Choice!**

20MHz Now Available!

Call now for details on
the New ZEOS 386SX-20.
Complete with 64K
SRAM Cache! Absolutely
Incredible. Add only \$300
to any package.

Incredible Upgrade Package #3

ONLY \$2095

Now take Two megabytes of memory and a second floppy drive and save even more! Your extras now include:

- Top quality 16-bit high res 1024 VGA color graphics card with 512K video RAM.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt & Swivel.
- Two full Megabytes of High Speed DRAM.
- A second Teac floppy drive, 3.5," 1.44 MB.
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse!

Incredible Upgrade Package #4

ONLY \$2295

Want an even bigger hard disk? Package #4 gives you all the extras *plus* our Fast 85MB hard drive. Outrageous savings!

- High Speed 85MB IDE Hard Drive.
- Top quality 16-bit high res 1024 VGA color graphics card with 512K video RAM.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt & Swivel Base.
- Two full Megabytes of High Speed DRAM.
- A second Teac floppy drive, 3.5," 1.44 MB.
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse!

**ORDER NOW TOLL FREE:
800-423-5891**

Your own ZEOS 386SX!
Only \$1295

Call Now!
800-423-5891

YES, COMPLETE. \$1295

Editor's Choice! "ZEOS comes in a winner... The fastest SX tested... packing plenty of value... great expandability, quality parts and down to earth pricing... how could you go wrong?" *PC Magazine, Editor's Choice.*

How could we say it any better? You simply can't go wrong. The ZEOS 386SX is the best you can buy.

And right now, you can buy your own *complete* ZEOS 386SX 42MB hard drive system for only \$1295!

Nothing can touch it. The ZEOS 386SX gives you Guaranteed Value you simply can't get anywhere else. And ZEOS is America's premier '386 systems manufacturer. After all, *PC Magazine* selected ZEOS '386 systems "For Overall Excellence" above all others. But why do they call the ZEOS 386SX "a terrific choice"? Four key reasons:

Performance. Quality.



YOU WANT PERFORMANCE? THIS IS IT!

ZEOS has invested literally thousands of hours creating the world's finest 386SX.

And as *PC Magazine* said "it is the fastest SX tested," an awesome performer indeed!

This is no rehashed '286 design. It's a true '386 from the ground up. A Rock Solid Investment that runs circles around everything else out there.

PC LABS BENCHMARK SERIES R

	Instruction Mix	Floating Point Calculation
ZEOS 386SX/16	3.99	6.98
IBM PS/2 Model 55SX	4.46	8.46
Compaq Deskpro 386S	4.48	9.67

QUALITY YOU CAN COUNT ON. ZEOS QUALITY.

Your ZEOS 386SX is designed and manufactured right in our own laboratories. We have used only the *very best* components available. From the power supply right thru to the video, every component is absolute top quality.

As an example. If you order a mono system you'll appreciate the fact that we use only genuine Hercules® brand monochrome graphics cards. They cost us more than double what others pay for their cheaper "Hercules compatible" cards. But Hercules® is quality. Quality you deserve.

And if you're a VGA buyer you'll absolutely *love* our VGA display. As *PC Magazine* said "the ZEOS VGA display and card prove to be one of the fastest overall... tying with the Compaq Deskpro 386S." Now that's *hot* video!

Even the floppy drive. Yours will be a genuine Teac®. They cost a lot more but you simply can't buy better. ZEOS systems. Quality from the ground up.

AN INCREDIBLE PRICE FOR AN INCREDIBLE MACHINE.

Incredible is the word! How can we build your

Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All Microsoft, MS-DOS and Windows are trademarks of Microsoft Corporation. IBM and PS/2 are trademarks of IBM Corporation. © ZEOS International, Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA.

ZEOS IS THE LEADER

10 Good Reasons To Buy From ZEOS®

Reason #1

"Overall Excellence."

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but five times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed: Excellent. Compatibility: Excellent."



Value: Excellent."

Personal Computing said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."

Reason #5

Warranties and Guarantees.

ZEOS believes in its products. That's why we offer each and every customer our 30 Day Absolute Satisfaction Money Back Guarantee, no questions asked. Plus, our One Full Year Limited Warranty and Express Parts Replacement Policy. Optional On Site Service is available too. Call for details.

Reason #6

24 Hour Toll Free Technical and Sales Support.

At ZEOS, the customer is #1. That's why we invented 24 Hour a Day Tech Support. For *your* convenience. If you buy a product from us we feel we should be there to help, any time of the day or night. Give us a call Toll Free! 800-423-5891. Anytime!

Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.

Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

Reason #9

Easy to Buy.

ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, Discover, American Express, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

And now the Z-CARD! It's your very own ZEOS Credit Card and you can apply today. With the Z-CARD you can charge your ZEOS purchases and pay in easy monthly installments. It's just like a Bank Card. Why not apply for your Z-CARD now!

Reason #10

You're Going to be Very Satisfied.

When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, we *Guarantee it!*

FAX Orders Dial: 612-633-1325
In Minnesota Call: 612-633-4591
MasterCard, VISA,
Discover, AmEx,
Z-Card and COD
Open 24 Hours a
day, 365 Days
a year.

Order Now
Toll Free



800-423-5891

COMPUTERS

20-MHz 386SX PCs

ROLE REVERSAL

That same performance advantage held true when the SX was compared with noncaching 20-MHz DX computers, but the pricing situation was reversed: The DX machines were more costly than the SXs. As a result, 20-MHz DX computers are now as rare as the white tiger, and most manufacturers have removed them from their sales lists. In fact, 20-MHz SX caching computers not only work faster than noncaching 20-MHz DX machines, they also come close to the performance level of noncaching 25-MHz DX computers.

Our latest look at the SX market assesses nine machines from AGI, AST, CompuAdd, Computer Market Place, Diamond Technologies, Eltech, Leading Edge, Micro Express, and Zenith. All of the systems are caching SXs, equipped with 4MB of RAM, 100MB to 200MB hard disks, a high-density floppy disk drive, and color VGA or Super VGA display subsystems, and all have FCC Class B ratings (which means they may be sold for both business and home use). Computers from Panther Systems and Polywell Computers were cut from the group because they failed to provide Class B identification numbers that corresponded with the systems they submitted. *PC Magazine* insists on Class B certification for 386SX PCs, as we view them as ideal for home use.

IT'S ALL IN THE CACHE

The advantage of processor RAM cache is obvious; systems that have it perform better than their noncached competitors. The sole exception was

the Leading Edge D3/SX20c, which performed much slower than the others. At any speed, this group represents a major standard-configuration upgrade over our initial crop of 40 (with 2MB more RAM and about twice the hard disk storage). In this configuration, the "ideal entry-level computer" will cost about \$3,400; in fact, most of the systems we reviewed can be found for under \$3,000. Take into account the costs of the upgraded video, memory, and hard disk (roughly \$100, \$200, and \$400, respectively) and you'll see that the prices of these systems are effectively decreasing since our last review.

Expanding an SX to this level puts it into an interesting position relative to its more powerful 25-MHz 80386DX siblings. The performance gain of the 25-

MHz DX over the 20-MHz SX ranges from 12 to 30 percent (based on averages of the 80386 Instruction Mix and Floating-Point Calculation test scores). The larger performance differences are found in caching models of the 80386DX compared with caching SXs (though cached 386/25s typically cost more, too).

The price of a mail-order DX-based computer with 4MB of RAM and a 150MB-to-200MB hard disk ranges from about \$2,600 to about \$4,300. (Corporate sellers up the ante to the \$7,000-plus level.) The high-end SX machines in this review—and make no mistake, that is what they are—sit squarely in DX pricing territory. Should you purchase an SX if a comparable DX machine is similarly equipped and has the same pricing and warranties, yet has a higher performance index? The answer is a resounding no. But

that conjunction of circumstances will arise only if you attempt to overconfigure your SX. In these reviews we've taken the 80386SX to the limit—to the point where expanding your SX is just barely feasible from a price/performance standpoint; beyond this level, you should buy a new DX.

For applications that can be contained within 2MB of RAM and 80MB to 100MB of disk space, you will be able to find caching SXs aplenty in the \$2,000 to \$2,800 range—well below even low-end DX pricing. When you compare overall system performance (not just processor but hard disk and video speeds as well), the losses are small. And the savings are excellent, if you configure an SX system properly for the job it was meant to do.



EDITORS' CHOICE

• CompuAdd 320sc

Only CompuAdd's 320sc stands out in this group of nine cached 386SX/20s, joining the NEC PowerMate SX/20 and the Tangent 386SX/20 previously chosen as Editors' Choice in this category (*PC Magazine*, November 27, 1990). Overall, if you're looking for a computer in this price range, you may be wise to consider a more powerful 386/25.

CompuAdd delivers its deluxe 320sc in a slimline case that measures only 4 inches high. To maximize its expansion space, the company builds the VGA video and I/O ports into the motherboard. And though the \$3,411 price is high compared with others in this group, you'll get the benefits of a fast, spacious 200MB Seagate hard disk that runs at 17 milliseconds, superb video (and a stunning Seiko monitor capable of 1,024-by-768 resolution), and the 64K cache that boosts processor speed past the noncached 386DX/20 level. CompuAdd also placed first or second on six of our nine benchmark tests.

Most of the other systems failed to distinguish themselves, but Eltech Research deserves honorable mention for putting together the most expandable 386SX/20, the Eltech 2200. All five of the system's drive

bays are accessible from the front of the unit, and six of the eight slots remain open in our standard configuration. The \$2,649 price is extremely competitive and includes 4MB of RAM, a 64K processor RAM cache, a 106MB hard disk, and a Super VGA color display subsystem.

There were disappointments in this bunch, too—in particular, the AST Premium II 386SX/20 Model 113V and the Micro Express ME 386-SX/20/Caching. The AST Premium II's proprietary Completely Universal Processor I/O Design (CUPID) architecture offers no performance benefits over the standard bus, and even if you factor in a 30 percent dealer discount, the system's \$4,770 list price begs the question, why not buy a 386/25?

On paper, the Micro Express ME 386-SX/20/Caching appears to be a fast, competitively priced PC. But we had too many problems with the system to recommend it. The first review unit that came to PC Magazine Labs had a beta BIOS; a second unit came with a hard disk that needed reformatting and a motherboard that wasn't screwed down properly. Will your PC suffer from hurried construction, too?

AGI COMPUTER INC.

AGI 3000B

by Bruce Brown



AGI 3000B, \$3,998.

AGI's small-footprint 20-MHz 80386SX system has room for three drives and can expand to 8MB RAM on the motherboard. AGI Computer is a wholly owned subsidiary of Everex Computers that sells systems solely to retail distributors, who in turn sell the machines to VARs. Although the price of the AGI 3000B looks high, you should keep in mind that VARs typically sell systems bundled with software and other components and usually offer significant discounts.

Our pricey \$3,998 review unit was set up in our standard configuration, with 4MB RAM, a 1.2MB TEAC floppy disk drive, a 16-millisecond-rated 132MB Micropolis ESDI hard disk, an Everex VGA video card and color VGA monitor, and DOS 4.01.

The AGI's benchmark test results hit both extremes. Its processor times were the fastest in the group, but its Conventional Memory test results were tied for slowest. The disk scores also ranged from high to low, depending on the test; the AGI's BIOS Disk Seek 0.44-millisecond test score appears fast, but occurred because the controller's BIOS does not perform a disk seek. Otherwise, the AGI's disk and video scores were average or slightly above average.

AGI's Everex-manufactured motherboard uses AMI BIOS chips, slightly altered to include fixed video and system ROM BIOS shadowing. There is also a

CMOS setup program using an attractive screen for system configuration. The system runs at either 8 or 20 MHz; the I/O bus speed is fixed at 8 MHz.

All system memory is installed directly on the motherboard, using up to eight SIMM slots accommodating a maximum of 8MB of 80-nanosecond RAM. A nonexpandable but certainly adequate 64K processor RAM cache is standard. The motherboard also has a socket for an 80387 20-MHz math coprocessor.

The system comes with eight interface card expansion slots, including two 8-bit and six 16-bit slots. In the tested configuration, three slots were occupied by the video card, the drive controller, and the I/O card. For applications that are typically used on systems like the AGI, you probably won't need that much expandability, but you may feel reassured to know it's there.

Internal drive space is limited to three half-height devices, all of which can hold removable media. One drive bay was left empty on our review unit. The standard 200-watt power supply provides more power than you're likely to need, and it includes four device power connectors.

The AGI's case measures 6.5 by 17 by 16.5 inches (HWD). The power switch is located on the right side and a reset button is in front. The AGI has no turbo switch, although it does have a turbo mode indicator light on the front of the case. Both an electronic keyboard lock and a mechanical case lock are combined in a single unit—a desirable feature for keeping people from opening the case to remove components or from physically harming the unit.

SUPPORT OPTIONS

Since AGI sells systems solely through VARs who buy them from distributors, all service is normally done by the VARs. Buyers can also use authorized Everex service centers. AGI does sell an optional on-site service contract, available through the VAR channel: \$80 for the first year, with extended coverage available. The standard warranty covers parts and labor for one year.

The AGI 3000B's mixed processor and memory test results do raise a minor question about the tuning of the machine's motherboard, although the relative times were similar to those of a Computer Market



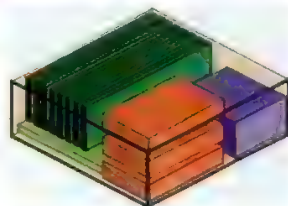
FACT FILE

AGI 3000B

AGI
Computer
Inc., 48630
Milmont Dr.,
Fremont,
CA 94538;
800-322-
3840, 415-683-2200.

List Price: With 2MB RAM, 64K processor RAM cache, color VGA display subsystem, \$1,950; with 4MB RAM, 132MB hard disk, 1.2MB floppy disk drive, DOS 4.01, \$3,998.

In Short: The small-footprint AGI 3000B has moderate expansion space and a higher-than-normal list price. This single-user machine, based on the Everex motherboard, is best used in situations where drive expansion is not a major issue. You can probably get a good discount, since AGI systems are generally sold through VARs.



CIRCLE 300 ON READER SERVICE CARD

Place machine utilizing another version of the same motherboard. If the AGI were sold at list price through regular dealers, it wouldn't be much of a deal. But since you can probably get a good discount from a VAR, you might check out this machine for use as a low-end single-user unit or as a network workstation.

AST RESEARCH INC.

AST Premium II
386SX/20 Model
113V

by Bill O'Brien

While everyone else is focusing on ISA-, EISA-, and MCA-bus computers, AST Research has decided to put its fate in the hands of CUPID. AST's Completely Universal Processor I/O Design (CUPID) is a proprietary 32-bit architecture that forms the foundation for the manufacturer's entire line of upgradable computers. The AST Premium II 386SX/20 Model 113V is the latest beneficiary of this maverick design.

Dressed as a 20-MHz 80386SX, the Premium II arrives in a basic configuration with 2MB of RAM, a 110MB hard disk, a 1.2MB or 1.44MB floppy disk drive, and built-in Super VGA video circuitry. With a Super VGA-compatible monitor, the system's price comes to \$4,390. Add DOS 4.01 and bump the system RAM up to 4MB to meet PC

Lincoln Logs builds its management information systems with Enable software.



Making things fit is critical for a supplier of custom log homes. That's why Lincoln Logs, of Chestertown, N.Y. chose Enable Software.

Enable is the focal point of a multi-branch, 35 user information management system that includes a PC network, an IBM AS400 Minicomputer, and a complex mix of software. Enable functions as a resource manager, establishing connections between Enable Word Processing, Database, Spreadsheet, and several dedicated programs.

Enable's powerful integration feature culminates in a sophisticated customer service program that lets Lincoln Logs track a customer from the inquiry stage to the completion of the log home. Enable will play a major role as Lincoln Logs integrates an automated custom-design process with its administrative functions.

Greg Schwab, Director of Data Processing, chose Enable because it offers a comprehensive system approach to Lincoln Logs information requirements. "One of Enable's real strengths is its customization

capability. We can shape and enhance an information management system specific to a user, or group of users."

Learn how you can build a better management information structure. Call Enable Department M, toll-free, and ask for your Enable building kit and your Enable/OA 4.0 demo disk, featuring a new more graphical look, pull-down menus, and desktop tools. Enable Software, 313 Ushers Road, Northway Ten Executive Park, Ballston Lake, NY 12019.

Enable™

*Integrated Software
to manage business.*

1-800-766-7079

CIRCLE 366 ON READER SERVICE CARD

© Enable Software Inc.



20-MHz 386SX-BASED PCs: SUMMARY OF FEATURES

Price of standard configuration For this review of 20-MHz 386SX computers with FCC Class B certification, we requested a standard configuration including a small-footprint case, 4MB RAM, at least 4K of RAM cache, a 100MB to 200MB hard disk, at least one high-density floppy disk drive, a VGA color video display subsystem, at least one parallel and two serial ports, a keyboard, and DOS 4.01. All nine PCs reviewed here provide a reasonably close match for this list of requirements.

The price of the standard configuration is followed by the **hard disk capacity**. All other table entries describe the features of the systems *PC Magazine* actually tested. Refer to each fact file for the price of the tested configuration.

Distribution channel Some machines are sold direct, others through dealers. Dealers often offer discounts of 25 percent or more off the list price (although there is no guarantee that the discounts will run this high).

Chip set manufacturer indicates which company makes the support logic that connects the CPU with the other functions managed by the system board. In some cases the computer uses discrete logic rather than a chip set.

System RAM arrangement refers to the method in which memory is addressed. Different arrangements aim at avoiding the wait states imposed when CPU speed outpaces conventional memory speed.

Page-mode architecture allows back-to-back memory accesses within banks of RAM defined as pages, avoiding wait states.

Interleaved RAM arrangement divides memory into two or four portions that process information alternately. The CPU sends information to one section for processing while another section goes through a refresh cycle.

Row/column, the original method of accessing data, is a subset of the page-mode memory architecture.

Installable RAM indicates the minimum and maximum amount of memory that can be installed, using any combination of chips and proprietary cards.

RAM packaging (and rated speed)

Memory comes in a variety of packages: DIPs, SIPs, and SIMMs. Rated speeds typically range from 60 to 80 nanoseconds for main memory (dynamic RAM) and 15 to 30 nanoseconds for cache RAM (static RAM).

The traditional *DIP (dual in-line package)* chip, commonly used for fast cache RAM, sprouts 4, 7, 12, 20, or more metal legs on both right and left sides.

SIPs (single in-line packages) are single-package arrays of computer chip logic assembled so that all connecting legs are in a straight line, like the teeth on a comb. They can be individual chips or multiple chips on a small card, with a proprietary SIP connection.

SIMMs (single in-line memory modules) consist of individual chips installed on a small circuit board that plugs into a larger device, such as a motherboard. SIMMs are easily installed and replaced.

Chip size Kb and Mb refer to kilobits and megabits, respectively. Combination chips (4x256Kb) are generally faster and more expensive.

The **BIOS version and date** can affect PC Magazine Labs' benchmark test results. Those purchasing the same machine with a different BIOS version may encounter some variations in performance.

Setup can reside either on a floppy disk or in ROM.

Shadowing Shadow RAM is a technology that loads video BIOS or system BIOS directly into fast RAM on boot-up of the computer, offering enhanced performance speed. It uses a segment of system memory located between the boundary of conventional memory (640K) and the end of the first megabyte of installed RAM.

Hard disk interface Within the 386SX PC environment, the most common hard disk interfaces are *IDE (integrated drive electronics)*, *SCSI (small computer system interface)*, and *ESDI (enhanced small device interface)*. IDE drives contain their own controller electronics.

Bus speeds Bus speed becomes more important as computers run at faster clock speeds. A computer's bus speed may actually be too fast for expansion cards, most of which operate at 8 MHz.

Slots free in fully configured PC indicates the number of open slots after disk drive controllers, a display subsystem, and one parallel and two serial ports are installed.

The **display circuitry** can reside on an expansion card or on the motherboard. Motherboard circuitry is often faster, but if it cannot be disabled it can't be upgraded.

DOS versions and prices are listed here. If no price is shown, the base-priced system includes DOS. (*PC Magazine's* standard configuration includes DOS 4.01—or, if it is not available, DOS 3.3—to allow more-accurate price comparisons.)

Where **OS/2** is available, the version number and list price are provided.

Disk caching software Software such as SMARTDRV.SYS or *Super PC-Kwik* facilitates data retrieval from the hard disk. It is listed here if the vendor supplies it free of charge.

Expanded memory manager software emulates the Lotus/Intel/Microsoft (LIM) expanded memory manager within the extended memory of a 386 or 486 PC.

Other software is listed only if bundled free of charge.

Number of device connectors indicates how many internal storage devices the power supply can support without requiring Y cables (power splitters).

FCC certification class Every system in this review has a Class B rating from the Federal Communications Commission and can therefore be purchased for home use. Each system with this rating has an **FCC Class B Identification number**. To verify a PC's certification, you can dial up the Public Access Link, the FCC's own bulletin board service, at 301-725-1072.

CONTINUES

"A SOLID, COMPLETE MACHINE THAT SETS THE STANDARD FOR THE REST OF THE INDUSTRY"

MAR. 1991, COMPUTER SHOPPER



They're here!

Notebook size 386SX systems that can perform as well as most desktops, even though they weigh only 6.5 pounds and fit into your briefcase.

- LCD VGA Back-Lit Super Triple Twist Screen 640 x 480
- Sleep Mode Conserves Battery Power While System Is On
- Suspend Mode To Halt And Later Resume Work
- Uses Rechargeable D size Batteries
- 3 To 4 Hours Operation
- Free FastLynx Notebook-to-PC Software & Cables
- Only 6.5 Pounds
- Size: 8.5" x 11" x 2"

NB/320SX \$2,650
20MHz/LCD VGA/2MB/20MB HD

NB/320SX PLUS \$2,850
20MHz/LCD VGA/4MB/20MB HD

NB/320SX SUPER \$2,995
20MHz/LCD VGA/4MB/20MB HD/MODEM

DataWorld 386SX/NB Notebook Standard Features

- Intel 386SX 20MHz CPU
- High-Speed 20MB Hard Drive
- 80387SX Coprocessor Support
- 3.5" 1.44MB Floppy
- 1 Parallel, 2 Serial Ports

- 80-Key Keyboard
- 12 Function Keys
- Connector For External 101 or PS2 Full-Size Keyboard
- Video Port For Full-Size VGA Monitor
- MS-DOS 4.01

DataWorld 386SX/NB Notebook Optional Features

- 80387SX Math Coprocessor
- Matsushita or NEC Full-Size VGA Monitor
- Mouse
- Internal Fax/Modem

- 3 Slot Expansion Box
- Automobile Lighter Power Adapter
- Second Battery Pack With Charger
- Leather Carrying Case



DataWorld LP320 Laptop Standard Features

- Intel 386DX 32-bit 20MHz CPU
- LCD VGA Super-Twist Screen
- Conner 43MB Hard Drive
- 80387 & 80287 Support
- 3.5" 1.44MB Floppy
- 1 Parallel, 2 Serial Ports
- 1 Expansion Slot

LP/320 \$2,650
20MHz/LCD VGA/1MB/43MB HD

LP/325 \$3,495
25MHz/LCD VGA/1MB/43MB HD



DataWorld PORTACOMP III Standard Features

- Intel 386 20MHz or 486 25MHz CPU
- 80387 & 80287 Support
- 3.5" Floppy Drive
- 1 Parallel, 2 Serial Ports
- 2 16-bit ISA Expansion Slots
- VGA Gas Plasma 640 x 480

PORTACOMP III 386/25 \$2,970
25MHz/VGA GAS PLASMA/4MB RAM/40MB HD

PORTACOMP III 486/25 \$4,130
25MHz/VGA GAS PLASMA/4MB RAM/40MB HD

WE'RE OPEN MONDAY THRU FRIDAY FROM 6AM TO 6PM
AND ON SATURDAY FROM 9AM TILL 3PM PACIFIC TIME

All DataWorld Sales Are Backed By
**30-DAY MONEY-BACK
SATISFACTION GUARANTEE**

If you're not satisfied with your purchase return it within
30 days for a full refund (excludes shipping charges)

All DataWorld Systems Are Protected

**1-YEAR WARRANTY ON PARTS & LABOR
WITH LIFETIME TOLL-FREE TECH SUPPORT**

Corporate/Government purchase orders accepted upon approved credit

1-800-736-3282

In California call (213) 695-3777
Fax: (213) 695-7016

DATA
DATAWORLD

3733 San Gabriel River Parkway
Pico Rivera, CA 90660-1404

PC
MAGAZINE

Endurance Tests Data
80/25A—MAR 16, 1990

PC
MAGAZINE

EDITORS'
CHOICE

PC
MAGAZINE

EDITORS'
CHOICE

PC
MAGAZINE

EDITORS'
CHOICE

PC
MAGAZINE

EDITORS'
CHOICE

Our Award-W And The Pow



inning 386sx. er Behind It.

NCR System 3000. The First PC Family That Doesn't Stop With PCs.

PC Magazine named the NCR System 3320 their Editor's Choice as the top-performing 20MHz 386sx PC.

They said "This latest 20MHz 386sx places the corporation at the forefront of technology...its performance marks it as one of NCR's best machines to date." And *Byte* called it "very impressive."

Compared to other Micro Channel™ PCs, the 3320 offers superior price/performance and faster memory architecture. It has SuperVGA and a SCSI controller for enhanced I/O built onto the processor board. And it can be upgraded to the more powerful i486* processor quickly and easily.



Those features alone would make the 3320 the best buy in its class. But what's behind the 3320 is even more impressive than what's inside it.

What's behind it is the world's most complete, end-to-end computer line—the NCR System 3000 family. An open, scalable family based on the powerful Intel® x86 chipset series. From portables to desktops to servers to future massively parallel systems that will reach performance levels of more than 100,000 MIPS, the System 3000 gives you the widest range of open computing options in the industry.



The System 3000 offers total scalability of hardware *and* software, and complete object code compatibility, to give you access to an enormous application software suite. Start with the System 3320, and there's no limit to your growth.

The System 3000 is designed to connect to your current computing environment. So customers with large investments in proprietary systems can preserve that investment, while moving toward a more flexible, open environment.

For more information on the NCR System 3320 and the rest of the System 3000 family, phone 1-800-CALL NCR. You'll find that our award-winning 386sx is the start of something big.



Open, Cooperative Computing.
The Strategy For Managing Change.

*Source: *PC Magazine*, November 21, 1990. **Source: *Byte*, May 1990.
NCR is the name and mark of NCR Corporation. Intel and i486 are registered trademarks of Intel Corporation. Micro Channel is a trademark of IBM. © 1991 NCR Corporation
CIRCLE 242 ON READER SERVICE CARD

COMPUTERS

20-MHz 386SX PCs



20-MHz 386SX-BASED PCs: SUMMARY OF FEATURES

Products listed in alphabetical order by company

	AGI 3000B	AST Premium II 386SX/20 Model 113V	 CompuAdd 320sc	Computer Market Place Ultra 386SX-20	Diamond Technologies DT 386SX-20	Elitech 2200
Price of standard configuration	\$3,998	\$4,770	\$3,411	\$3,602	\$2,084	\$2,649
Hard disk capacity	132MB	110MB	200MB	200MB	100MB	106MB
Distribution channel	Dealers	Dealers, direct	Direct	Direct	Direct	Dealers, direct
Dimensions (HWD, in inches)	6.5 x 17 x 16.5	6.8 x 15.8 x 16.5	4 x 16.4 x 15.5	6.5 x 17.3 x 16.8	6.3 x 16 x 16.5	6.5 x 16 x 16.5
Motherboard manufacturer	Everex	AST	CompuAdd	Club	MCS	Mycomp
Chip set manufacturer	VLSI Tech	Discrete logic	Texas Instruments	VLSI Tech	Intel/VLSI Tech	Opti
System RAM arrangement	Interleaved page-mode	Interleaved page-mode	Row/column	Interleaved page-mode	Page-mode	Page-mode
MEMORY						
Installed RAM	4MB	4MB	4MB	4MB	4MB	4MB
Installable RAM	1MB-8MB	1MB-16MB	512K-16MB	1MB-8MB	1MB-16MB	1MB-16MB
RAM packaging (and rated speed)	SIMM (80 ns.)	SIMM (80 ns.)	SIMM (80 ns.)	SIMM (80 ns.)	SIMM (80 ns.)	SIMM (80 ns.)
Chip size	1Mb	1Mb	1Mb	1Mb	1Mb	1Mb
PROCESSOR RAM CACHE						
Cache controller	Discrete logic	Intel	Austek	Discrete logic	Intel	Opti
Installed RAM	64K	16K	64K	64K	16K	64K
Other installable RAM options	None	None	32K	None	None	16K, 32K
RAM packaging (and rated speed)	DIP (20 ns.)	DIP (25 ns.)	Proprietary (35 ns.)	DIP (20 ns.)	DIP (35 ns.)	DIP (20 ns.)
Chip size	8x32Kb	16Kb	32Kb	32Kb	16Kb	32Kb
BIOS						
BIOS version	AMI G1-36 K9	AST 1.0	Phoenix 1.10.00	AMI G1-36 K9	Award 3.15	AMI
Date	September 1990	1990	December 1990	September 1990	September 1990	October 1990
Setup/password in ROM	■ / □	■ / ■	■ / □	■ / □	■ / □	■ / □
Video shadowing/System shadowing	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■
DISK DRIVES						
Hard disk capacity and interface	132MB ESDI	110MB IDE	200MB IDE	89MB ESDI	100MB IDE	106MB IDE
Manufacturer	Micropolis	Conner	Seagate	Seagate	Quantum	Toshiba
Average access time	16 ms.	15 ms.	17 ms.	16 ms.	18 ms.	25 ms.
Controller manufacturer	Everex	N/A	N/A	Western Digital	N/A	N/A
Controller location	Card	N/A	N/A	Card	N/A	N/A
Drive bays	3 half-height	2 half-height, 1 third-height, 2 3.5-inch	1 half-height, 2 3.5-inch	3 half-height	3 half-height, 2 3.5-inch	3 half-height, 2 3.5-inch
Hard disk options	None	40MB-110MB	76MB-200MB	40MB-200MB	80MB-200MB	40MB-300MB
Floppy/hard disk controller	■	■	■	■	■	□
Floppy disk capacity	1.2MB	1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB
EXPANSION BUS						
Bus speeds	8 MHz	8 MHz	7.1 MHz	8 MHz	8 MHz	6.6 MHz, 10 MHz
Expansion slots (8-, 16-, 32-bit)	2, 6, 0	1, 5, 0	2, 3, 0	1, 7, 0	2, 5, 0	0, 8, 0
Slots free in fully configured PC	5	5	5	5	5	6
Ports originate on motherboard	□	■	■	□	■	□
VIDEO						
Display mode	VGA	SVGA, 1,024 x 768	SVGA, 1,024 x 768	SVGA, 1,024 x 768	SVGA	SVGA
Display circuitry location	Card	Motherboard	Motherboard	Card	Card	Card
Interface	16-bit	16-bit	16-bit	16-bit	16-bit	16-bit
Controller manufacturer	Everex	AST	Tseng	Renaissance	Orchid	Diamond
Chip set manufacturer	Tseng	Paradise/ Western Digital	Tseng	Xilinx	Tseng	Tseng
KEYBOARD/MOUSE						
Keyboard manufacturer	Key Tronic	NMB	Mitsumi	Focus	Maxi-Switch	NMB
Number of keys, function keys	101, 12	101, 12	101, 12	138, 24	101, 12	101, 12
Keyboard cable length (inches)	72	72	22	72	56	82
Dedicated mouse port	□	■	□	□	□	□

 Editors' Choice ■—Yes □—No

N/A—Not applicable: The product does not have this feature.

COMPUTERS

20-MHz 386SX PCs

Leading Edge D3/SX20c	Micro Express ME 386-SX/20/ Caching	Zenith Z-386 SX/20
\$3,874	\$2,364	\$5,597
105MB	200MB	80MB
Dealers	Dealers, direct	Dealers
5.3 x 15.4 x 15.9	7 x 14.8 x 16	6.12 x 14 x 15
Daewoo	Micro Express	Zenith
VLSI Tech	VLSI Tech	Texas Instruments
Interleaved	Interleaved page-mode	Interleaved

4MB	4MB	4MB
2MB-16MB	1MB-16MB	2MB-16MB
SIMM (80 ns.)	SIMM (80 ns.)	SIMM (80 ns.)
1Mb	1Mb	1Mb

Austek	Intel	Discrete logic
32K	16K	32K
None	None	128K
Proprietary (20 ns.)	DIP (35 ns.)	DIP (35 ns.)
16Kb	32Kb	8Kb

Phoenix 1.10 14	Award 3.10	Zenith 4.0
January 1988	December 1990	December 1990
■ / □	■ / □	■ / ■
■ / ■	■ / ■	■ / ■

105MB IDE	200MB IDE	80MB IDE
Quantum	Maxtor	Quantum
17 ms.	19 ms.	19 ms.
N/A	N/A	N/A
N/A	N/A	N/A
2 half-height, 1 third-height, 1 3.5-inch	3 half-height, 2 3.5-inch	1 half-height, 2 3.5-inch
40MB-105MB	40MB-750MB	40MB-80MB
■	■	■
1.2MB, 1.44MB	1.2MB, 1.44MB	1.44MB

8 MHz	8 MHz	8 MHz, 16 MHz
0, 4, 0	0, 7, 0	0, 5, 0
4	5	4
■	■	■

SVGA	SVGA, 1,024 x 760	VGA
Card	Card	Card
16-bit	16-bit	16-bit
ATI	Micro Express	Headland
ATI	Tseng	Headland

Leading Edge	Maxi-Switch	Alps
101, 12	101, 12	101, 12
72	72	60
■	□	□

CONTINUES



AST Premium II 386SX/20 Model 113V,
\$4,770.

Magazine's standard configuration and you're faced with a daunting \$4,770 price tag for an SX system.

A THOUGHTFUL CASE

The 6.8- by 15.8- by 16.5-inch enclosure has front-mounted power and reset switches. AST has also thoughtfully included a front-mounted monitor switch that lets you set the machine for the type of video adapter you're using without tearing the case apart in search of some obscure motherboard jumper or DIP switch.

Also available on the front panel are three half-height drive bays, one of which was filled with a 1.44MB floppy disk drive in the machine we tested. AST has a proprietary mounting arrangement for a 3.5-inch drive to the right of the half-height bays; on our review unit, it was taken up with a 110MB IDE Conner hard disk. This configuration leaves two half-height bays open for additional expansion. The Premium II is juiced by a capable 220-watt power supply.

CUPID'S ARROW

The CUPID-32 backplane is where AST's technology comes to the fore. There are six slots on the board; from a strictly ISA standpoint, one of them is 8-bit and five are 16-bit. CUPID-32, however, adds extensions to three of the 16-bit ISA slots. While leaving them ISA-capable, the extensions also allow the slots to conform to the CUPID specification. Because it uses a backplane design, the Premium II contains neither processor nor RAM. These, along with the socket for the

coprocessor, are located on a processor card that fits into one of the ISA/CUPID slots.

The system's processor card is capable of handling a maximum of 16MB of RAM. With only four SIMM slots, it's highly dependent on that rare device, the 4MB SIMM. AST lists no other CUPID-compatible boards for this machine, although it does tout CUPID-32 as the ideal method of upgrading to higher processor levels. (Processor cards appear to be the only CUPID boards available.) At worst, with video, disk controller, and parallel/serial I/O originating on the motherboard, you'll have five ISA slots left open.

AVERAGE PERFORMANCE

Seeing a price just a few hundred dollars below the cost of a low-end 33-MHz 386DX, you might expect the Premium II to make you quiver at its performance. Unfortunately, that was hardly the case on PC Magazine Labs' benchmark tests. Despite an Intel cache controller and 16K of 25-nanosecond cache chips, the Premium II proved decidedly average on the 80386 Instruction Mix, Floating-Point Calculation, and Conventional Memory tests. Likewise, the Conner 110MB hard disk was lackluster on our disk tests.

The built-in 800-by-600 Super VGA video system was an almost total disappointment in performance. The Paradise chip set's performance placed it among the worst three products reviewed when



FACT FILE

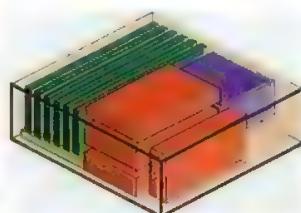
AST
Premium II
386SX/20
Model
113V
AST
Research
Inc., 16215

Alton

Pkwy., P.O. Box 19658, Irvine, CA 92713;
800-876-4278, 714-727-4141.

List Price: With 2MB RAM, 16K processor RAM cache, 110MB hard disk, 1.2MB or 1.44MB floppy disk drive, Super VGA display subsystem, mouse port, \$4,390; with 4MB RAM, DOS 4.01, \$4,770.

In Short: This is the most expensive 386SX/20 in the lot and offers no competitive edge. AST's proprietary Completely Universal Processor I/O Design (CUPID) lets you upgrade to higher processor levels, but it shows no performance advantage at this level. Video test scores were a particular disappointment. For this price, buy a 386/25.



CIRCLE 300 ON READER SERVICE CARD

COMPUTERS

20-MHz 386SX PCs



20-MHz 386SX-BASED PCs: SUMMARY OF FEATURES

Products listed in alphabetical order by company

	AGI 3000B	AST Premium II 386SX/20 Model 113V	PC CompuAdd 320sc	Computer Market Place Ultra 386SX-20	Diamond Technologies DT 386SX-20	Etech 2200
SOFTWARE						
DOS	4.01 (\$110)	3.3 (\$95), 4.01 (\$125)	4.01	4.01	3.3; 4.01 (\$85)	4.01
OS/2	1.21 (\$340)	1.1 (\$340)	1.21 (\$189)	1.3 (\$238)	1.2 (\$289)	1.2 (\$325)
Disk caching software	None	AST Cache	Smart Drive	None	None	None
Expanded memory manager	None	EMS 4.0	None	None	None	None
Other software	None	Diagnostics	Windows 3.0	None	None	Windows 3.0
MISCELLANEOUS						
Power supply (watts)	200	145	145	200	200	200
Number of device connectors	4	4	3	4	3	4
Keyboard/case lock	Front/front	None/front	None/none	Front/none	Front/none	Front/none
Power-on/reset switch	Side/front	Front/front	Side/none	Side/front	Back/front	Back/front
Warranty	1 year	1 year	1 year	1 year (2 years motherboard, RAM)	1 year parts, 2 years labor	1 year
Service	Dealer	Dealer	Dealer, vendor	Phone service	Phone service	On-site, dealer
FCC Class B Identification number	E3EEX-3000B	DJKASTM5386SX-20	F2P-320sc	E3EEX-3100F	F5H1386SX	GCM4DFELTECH2200

PC—Editors' Choice ■—Yes □—No

we addressed it directly by sidestepping the video BIOS. Even when the BIOS was used, the system only managed to eke its way into the middle of the pack. Luckily, you can plug in a video card to override the internal system—although AST doesn't list any cards on its option sheets.

Although AST PCs were rated respectably in our service and reliability blockbuster issue (*PC Magazine*, September 25, 1990), the company's one-year re-

certainty caused by yet another proprietary architecture. And its price will make you look twice to see just which three initials are on the front of the machine.

COMPUADD CORP. CompuAdd 320sc by Karen Best

CompuAdd Corp. has grown from a one-man outfit back in 1982 to a \$400 million mail-order and retail enterprise today. With the CompuAdd 320sc, the company adds another winner to its product list.

Our \$3,831 tested machine came complete with 4MB of 80-nanosecond DRAM, 64K of 35-ns. SRAM cache, a Seagate 200MB IDE hard disk, both 1.2MB and 1.44MB floppy disk drives, and a 20-MHz 80387SX coprocessor. In our standard configuration, with just one floppy disk drive and no coprocessor, the system sells for \$3,411. CompuAdd has also included Seiko's 14-inch CM-1440 Super VGA monitor, capable of 1,024-by-768 resolution with 256 colors. CompuAdd's VGA circuitry and 1MB video DRAM are both built into the motherboard. The CompuAdd 320sc also includes DOS 4.01 and *Microsoft Win-*



CompuAdd 320sc, \$3,831.

dows 3.0 in all configurations.

You can also opt for 1MB RAM, 32K processor RAM cache, a 40MB hard disk, one floppy disk drive, and monochrome graphics to bring the price down to \$1,859. The system architecture supports four banks of DRAMs, for up to 32MB of on-board memory, though only 16MB are usable in the DOS environment. The motherboard can use either 256K, 1MB, or 4MB 80-ns. SIMMs for system memory.

The AST is hampered by the uncertainty caused by yet another architecture.

turn-to-dealer warranty doesn't even add a small shot of adrenaline to this machine. AST does operate a toll-free support line as well as a BBS to field questions from its customers, but most service problems need to be referred to the dealer that sold the machine.

Despite the impressive name of the AST Premium II 386SX/20 Model 113V, the unit is hampered by slow disk and video performance and the nagging un-

COMPUTERS

20-MHz 386SX PCs

Leading Edge D3/SX20c	Micro Express ME 386-SX/20/ Caching	Zenith Z-386 SX/20
--------------------------	---	-----------------------

4.01	4.01	4.01
None	1.2 (\$279)	1.21 (\$339)
None	Super PC-Kwik (\$49)	None
None	QEMM (\$39)	EMMS
Windows 3.0	Windows 3.0 (\$150)	Windows 3.0, ToolBook

130	200	135
4	5	3
None/back	Front/none	None/back
Front/front	Front/front	Front/none
20 months	15 months	1 year

Dealer	Vendor	Dealer
DTSDC-35XY	H64IAT386SX120 IFO-ALPACA	

ENDS

TIGHT DESIGN

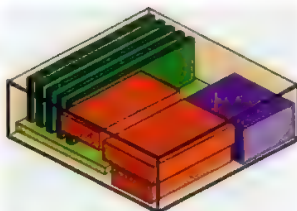
The CompuAdd 320sc's low-profile, small-footprint design (4 by 16.4 by 15.5 inches) features a tight design with the



CompuAdd
320sc
CompuAdd
Corp.,
17303
Technology
Bld.,
Austin, TX
78727; 800-
627-1967, 512-250-1489.

List Price: With 1MB RAM, 32K processor RAM cache, 40MB hard disk, 1.2MB or 1.44MB floppy disk drive, monochrome display subsystem, DOS 4.01, Microsoft Windows 3.0, \$1,859; with 4MB RAM, 64K processor RAM cache, 200MB hard disk, Super VGA adapter, 1,024-by-768 color monitor, \$3,411; with 1.2MB and 1.44MB floppy disk drives, 80387SX coprocessor, \$3,831.

In Short: The CompuAdd 320sc was among the top two performers on all our benchmark tests. Everything is built onto CompuAdd's well-designed motherboard. The five free slots may be a tight squeeze, but that's inherent in the slimline design. This is a quality machine backed by a reliable company.



SIMM memory, floppy/hard disk controller, VGA video controller, and parallel and serial ports all residing on the motherboard.

This leaves five free expansion slots, all mounted on an I/O tree. The boards are mounted horizontally, parallel to the motherboard: three 16-bit full-length slots on one side of the tree and two 8-bit half-length slots on the other. According to CompuAdd, this design uses the minimal amount of space.

Nevertheless, there's a minor problem inherent in the slimline design: You may have a little trouble putting a full-length card into the lowest 16-bit slot because of its close proximity to the SIMM banks. A three-quarter-length or half-length card will fit perfectly, though. And filling the two 8-bit slots might be a tight squeeze because of the proximity of the power supply. To be sure, you'll find these problems on most slimline units.

The CompuAdd 320sc also utilizes VLSI (very large-scale integration) chips to save space on the economically designed motherboard. CompuAdd does not overlook the details, however; every single item is clearly labeled, even the DIP switches.

IMPRESSIVE BENCHMARK TEST SCORES

The CompuAdd 320sc is a speedy machine. Overall, it was the best-performing computer in the group on our benchmark tests, finishing among the top three on all tests but one. One reason is its Seagate 200MB IDE hard disk with its 17-millisecond rating. This disk allowed the CompuAdd 320sc to perform well on all disk-related tests, with first place on both DOS File Access tests and a third-place 13.84-ms. score on our BIOS Disk Seek test.

The CompuAdd 320sc has both video and system BIOS shadowing that can be disabled from the ROM-based setup utility. The Tseng Laboratories chip set gave it a first-place finish on all video-related tests.

The top-performing CompuAdd 320sc is backed by a one-year warranty on parts and labor, a 30-day money-back guarantee, and toll-free technical support for the life of the product. CompuAdd's 320SC is a quality machine: It's reliable and backed by a company with a good reputation. This system proves that good things *can* come in small packages.

COMPUTER MARKET PLACE INC.

Ultra 386SX-20

by Bruce Brown



Computer Market Place Ultra 386SX-20, \$3,563.

Computer Market Place, a Pennsylvania-based mail-order house, assembles and sells computer systems from a wide range of component parts. Its small-footprint 20-MHz 80386SX system is an acceptable computer available at an aggressive price. But be careful if you're looking for a top performer: The Ultra 386SX-20 has a moderate amount of drive and memory expansion space, and it achieved only mixed results on PC Magazine Labs' benchmark tests.

QUALITY HARDWARE, ERRATIC PERFORMANCE

The Ultra's price is certainly right. In our standard configuration, which includes 4MB RAM, a 89MB 16-millisecond Seagate hard disk, a single floppy disk drive, an Orchid ProDesigner II Super VGA video board with 1MB of video RAM and color monitor, and DOS 4.01, the system sells for \$2,357.

The \$3,563 version we tested was pumped up a bit with both 1.2MB and 1.44MB TEAC floppy disk drives, a Rendition Renaissance II 1,024-by-768 video board, a 14-inch Seiko CM-1440 monitor, and the versatile 138-key Focus keyboard, which includes both vertical and horizontal function keys, diagonal-movement cursor keys, and a built-in calculator.

The motherboard in the Ultra is manu-



POPULAR PRAISE FOR THE PORTABLE DESKTOP

This new generation PC is remarkable for the performance and practicality it provides. Carry it from the office, to home, to multi-site locations so all your programs and files travel conveniently with you.

Customers and critics alike are praising the Brick for its portability, elegant design, whisper quiet operation and screamingly fast power. This diminutive PC with the unforgettable name is designed for the way you always wanted to do computing.

Here's a sampling from recent articles on the Brick.

"Every once in a while a PC product comes along in which the performance, design and concept are so uncommon that a little voice inside you says you really want to have one."

*Jon Pepper,
PC Sources, 11/90*

"Engineered with the way people actually work in mind. It answers the question of how to transport an entire environment to and from several work sites, something no other product handles elegantly."

PC/Computing, 12/90

"Overall the Brick represents a clever counter to conventional notebook designs. It solves the fundamental problem of two-location computing. You get to keep your home and away files in sync because they are the same."

*Tracy Licklider
BCS UPDATE, 7/90*

"Ergo's Brick maintains the functionality of a desktop PC within a small form-factor...the Brick is a real performer, consistently outperforming both Compaq's and IBM's 16 MHz SXs on PC Labs computer benchmark tests."

*Matt Ross,
PC Magazine, 9/25/90*

"The Ergo Brick—that delightfully small, full-featured 386SX™ machine. It's almost silent, it's fast... a great personal computer in every other respect too."

*Bill Machrone,
PC Magazine, 1/15/91*

"The Brick is the first real innovation in DOS based computers in a long, long time."

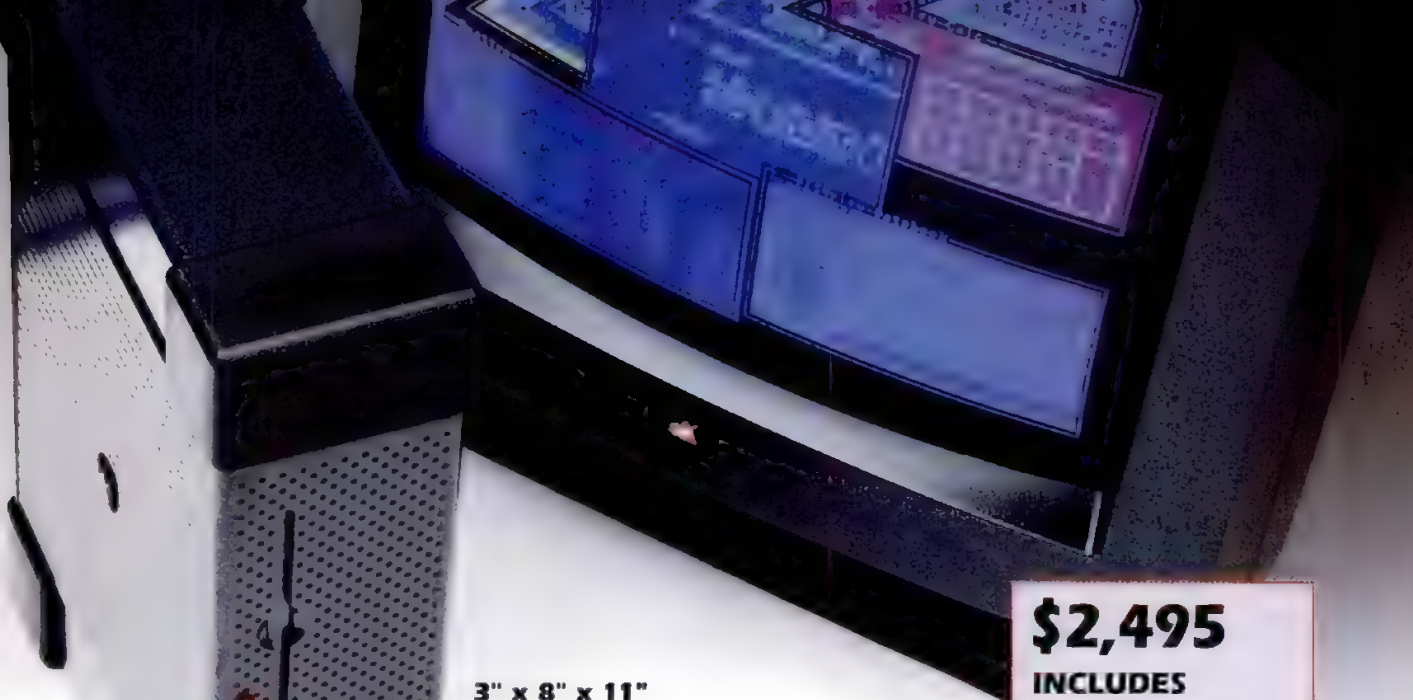
*Computer Shopper,
1/91*

"The philosophy behind the Brick is so obvious that I'm surprised that no one has thought of it before...you can keep a monitor and a keyboard at each work location, carrying only the computer guts (and your own data) between locations...in a world of boring and utilitarian PCs, the Brick stands out for both its elegance and its technological sophistication."

*Stan Miastkowski,
BYTE, 6/90*



THE BRICK



3" x 8" x 11"

"The Brick is a simple idea that is beautifully executed, resulting in a machine whose time has clearly come. You get the convenience of a laptop with the uncompromising performance of a desktop."

Jon Pepper,
PC Sources,
11/90

"An ideal system for those who split their working time between home and office...The stylish 'black granite' and beige cases look as if they came straight from the pages of a Sharper Image catalog."

PC Week, 9/24/90

Compaq... This system provides an amazing amount of features and support for the price."

Peter Varhol,
Personal Workstation
11/90



Hi-res video drivers are included for over 25 major applications including Windows 3.0, WordPerfect, Ventura, Autocad, Cadkey, and Lotus. The Docking Terminal (\$349) permits instant hook-up of all cables and adds another 16-bit 3/4 length slot.

"...everyone who sees it falls in love with it... Recommended."

Jerry Pournelle,
BYTE, 1/91

"Using the Brick is a pleasure. In fact, several things about the Brick are terrific. By any standard it's a well equipped and competitively priced 386SX desktop; when you add the appeal of its diminutive size, it becomes adorable."

Eric Grevstad,
Portable Office, 12/90



"The beauty of this arrangement is that you never have to worry about the consistency of your data files... you just take it all with you."

Henry Fersko-Weiss,
PC Magazine, 3/91

"Only slightly larger and heavier than a college dictionary, the Brick is a faux-granite-finished portable CPU that explores the middle ground between desktop PCs and portable computers."

\$2,495

INCLUDES

- ▲ 16 MHz Intel 386SX
- ▲ 4 MB RAM (exp to 8 MB)
- ▲ 44 MB 28ms hard disk
- ▲ 2,400 bps modem
- ▲ 1024 x 768 VGA adapter with 1 MB video RAM
- ▲ 3.5" floppy/1.44 MB
- ▲ 16-bit half card exp. slot
- ▲ DOS 3.3 or 4.01
- ▲ 1 year warranty
- ▲ 30 day money back guarantee
- ▲ Freight Prepaid

Plus Your Choice of:

- ▲ Windows 3.0 with Adobe ATM, Mouse
- or:
- ▲ DESQview/386 with QEMM, Manifest, Tree86, Cache86
- ▲ All software completely set up. Ready to go

Options:

- ▲ 104 MB 24ms HD add \$395
- ▲ 212 MB 16ms HD add \$995
- ▲ 20 MHz Brick add \$250
- ▲ 8 MB total RAM add \$396
- ▲ 387SX Coprocessor
 - 16 MHz add \$395
 - 20 MHz add \$445
- ▲ 12" 640 x 480 mono VGA monitor & 101 keyboard-beige add \$218
- ▲ 14" 640 x 480 color VGA monitor & 101 keyboard-beige add \$464
- ▲ Color coordinated VGA monitor & keyboard, as shown add \$195
- ▲ Docking Terminal add \$349

For further information
or to request our FREE Catalog

CALL TOLL FREE

1-800-633-1925

Or to receive information via FAX, 24 hours,

CALL 1-800-THE-BRICK

CIRCLE 479 ON READER SERVICE CARD

One Intercontinental Way
Peabody MA 01960

TEL: (508) 535-7510
FAX: (508) 535-7512



COMPUTERS

20-MHz 386SX PCs



FACT FILE

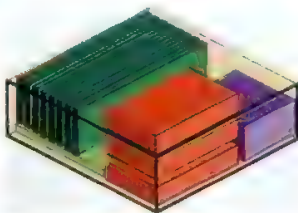
Ultra
386SX-20

Computer
Market
Place
Inc., 450
Pkwy.,
#202,
Broomall,

PA 19008; 800-545-7397, 215-359-0750.

List Price: With 1MB RAM, 64K processor RAM cache, 1.2MB or 1.44MB floppy disk drive, monochrome display subsystem, DOS 4.01, \$995; with 4MB RAM, 89MB hard disk, Super VGA color display subsystem, \$2,357; with 1.2MB and 1.44MB floppy disk drives, 1,024-by-768 display subsystem, \$3,563.

In Short: The small-footprint Ultra 386SX-20 comes at a good price but is otherwise an average workhorse system. The \$126 price for converting it to a 25-MHz DX machine makes it an even better buy.



a 64K processor RAM cache with 20-nanosecond SRAM chips, eight SIMM slots (for a total capacity of 8MB), and a socket for an 80387SX 20-MHz math coprocessor. The system board runs at either 8 MHz or 20 MHz, with the I/O bus speed fixed at 8 MHz.

The BIOS is published by AMI and slightly modified by the vendor to include an attractive screen for the CMOS setup program. Both video and system ROM BIOS are shadowed in RAM, and neither can be turned off. The video shadowing did not do much for performance speeds; without its video drivers loaded, the Ultra has by far the slowest video scores among the machines we tested. Other benchmark test results were mixed. It had the fastest Instruction Mix test scores but tied for third slowest on conventional memory. Its disk scores were middling.

the system speed via the setup program), but there is an LED turbo indicator on the case's front panel. The case has an electronic keyboard lock but no mechanical case lock—a small deficiency, but one that should be rectified in these days of increased security consciousness.

The Ultra has eight expansion slots in all: one 8-bit and seven 16-bit slots. Three slots are used by the hard disk controller, video, and I/O cards, leaving five slots free—which is ample for a small-footprint system.

The Ultra's 200-watt power supply has four device connectors, one more than is usable with the case's one half-height and two 3.5-inch drive bays. The tested configuration, with a hard disk and two floppy disk drives, has no more drive room—a common situation with small-footprint devices, but it might give you reason to pause if you have thoughts of adding an internal tape or CD-ROM drive.

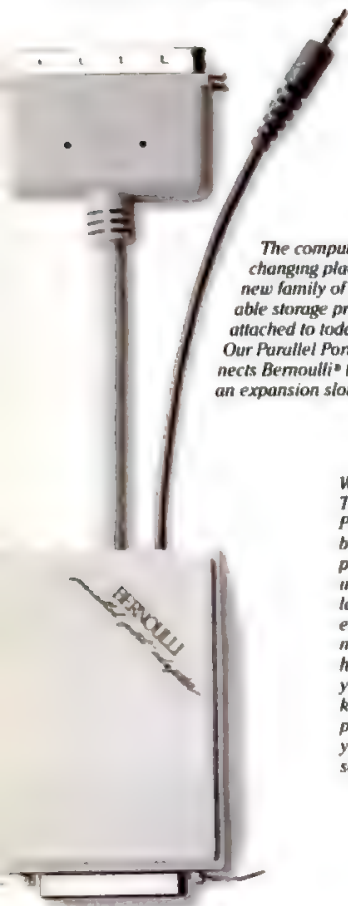
This is overall a fine computer, but since Computer Market Place sells a wide variety of systems, all at decent prices, you might want to consider this computer with an eye to the prices of the company's 16-MHz SX or 25-MHz DX machines. If

CIRCLE 401 ON READER SERVICE CARD

factured by an Everex subsidiary for Club American Technologies, which sells the board to Computer Market Place. This board is similar to the one in the AGI 3000B. The Ultra's motherboard includes

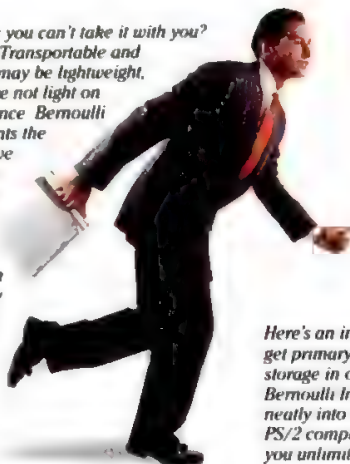
SMALL-FOOTPRINT TRADEOFFS

The Ultra's case measures 6.5 by 17.3 by 16.8 inches. The power switch is located on the right side and the reset switch on the front. You'll find no turbo switch (you set



The computing world is a changing place. That's why our new family of universal removable storage products can be easily attached to today's newest systems. Our Parallel Port Interface even connects Bernoulli® to computers without an expansion slot or SCSI port.

Who says you can't take it with you? The new Transportable and Portable may be lightweight, but they're not light on performance. Bernoulli implements the latest drive enhancements to help you keep pace with your busy schedule.

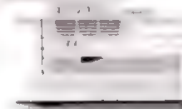
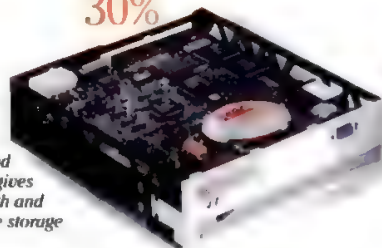


THE NEW B ANY SYSTEM. ANY

Bernoulli brought worry-free storage to everyone—now you can take it everywhere. Our new Transportable packs all the power and data security of our 44MB removable disk drive into a convenient, AC-powered unit.

PRICES
REDUCED
UP TO
30%

Here's an inside scoop: get primary and backup storage in one. The Bernoulli Insider fits neatly into leading PC and PS/2 computers. Plus, it gives you unlimited data growth and the security of removable storage.



COMPUTERS

20-MHz 386SX PCs

price is not your primary concern, you can get a true 25-MHz 80386DX computer for \$126 more than a similarly configured Ultra 386SX-20. On the other hand, if you watch every dollar, you can save \$100 by buying a 16-MHz SX-based computer from Computer Market Place.

The only feature lacking in this computer's service and support policy is on-site service. Computer Market Place does offer a two-year parts-and-labor warranty on the motherboard and RAM, one year on everything else, and a 60-day money-back guarantee. If you have a problem with your system, you can call the toll-free technical support line for help Monday through Friday from 8:45 till 7:00 or Saturday and Sunday from noon till 6:00. If a defective component or even the whole system is the culprit, Computer Market Place will ship the replacement overnight and will include a call tag to pay for shipping the defective parts back to the vendor.

The Ultra 386SX-20 is a machine with fair expansion room and mixed benchmark test scores. The price is right, but if you demand on-site service, you'll need to look elsewhere.

DIAMOND TECHNOLOGIES DT 386SX-20

by Greg Pastrick

Diamond Technologies has added some new facets to its 20-MHz 386SX line with the release of its 6.3- by 16- by 16.5-inch small-footprint DT 386SX-20.

In its tested configuration, \$2,179 buys 4MB of RAM, 16K of processor RAM cache, a 100MB hard disk, 1.44MB 3.5-inch and 1.2MB 5.25-inch floppy disk drives, a Super VGA display adapter with a 14-inch monitor, and DOS 4.01. If you knock off 3MB of RAM and settle for a smaller hard disk, one floppy disk drive, and a monochrome VGA display subsystem, you can have a 386SX system for below \$1,500.

When last seen in the pages of *PC Magazine*, Diamond was selling a mini-tower SX. By comparison, the current machine offers more improvements than additional size; the best news is that it offers improved performance for a relatively small price increase.



Diamond Technologies DT 386SX-20, \$2,179.

According to Diamond, the DT 386SX-20's components are based on a Micro Computer Systems motherboard, though the system board itself is stamped Strawberry. BIOS functions are handled by the Award M386SX chip; the motherboard makes extensive use of VLSI chip sets. An Intel 82385 chip manages 16K of processor RAM cache, and Diamond of-

BERNOULLI. TIME. ANY PLACE.

You don't have to pamper a Bernoulli. Its patented design flies a flexible disk precisely under the read/write head. Should your system encounter a bump, air impurity, or power loss, the disk simply falls away. The result? Hard-disk performance without the risks.



With all the computing choices out there, why limit your options? Our new universality is a unique innovation that lets you easily attach the same Bernoulli to most any system, giving your data (and budget) protection for tomorrow.

Bernoulli's removable disks are the most rugged available. And we back that up with an unheard-of 5-year Gold Standard Limited Warranty.

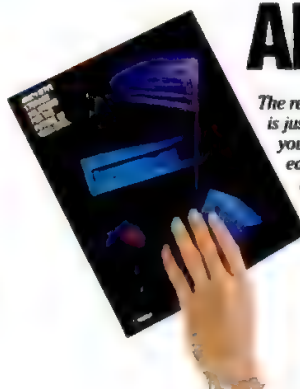


BERNOULLI AT A GLANCE

- Disk Configuration - 5.25" half-height 40 MB
- Drive Configurations - single or dual (internal or external) - battery-powered portable
- Effective Access Time - 22 msec
- Disk Shock - 1,000 Gs
- Mean Time Between Failure - 60,000 hrs.
- Compatibility - DOS, PC, PS/2, Macintosh, OS/2, Windows, NetWare, Unix
- Installed Base - 625,000 drives - 3,750,000 disks
- InfoWorld Buyers Assurance Seal



For the truly power hungry, the Bernoulli Dual gives you up to 89MB of removable on-line storage with a 22msec effective access time and unlimited off-line capacity. It makes disk-to-disk copies in under three minutes. That's performance for the real world—at a price that's been reduced up to 30 percent.



ANY QUESTIONS?

The rest of the Bernoulli story—including our new, lower prices—is just a phone call away. Dial 1-800-777-3488 for the location of your nearest dealer and we'll rush you a free copy of this limited-edition, 18-page brochure. It's packed with everything you need to know about removable data storage. Any way you like it.

OMEGA
The Makers of Bernoulli

CIRCLE 378 ON READER SERVICE CARD

COMPUTERS

20-MHz 386SX PCs



FACT FILE

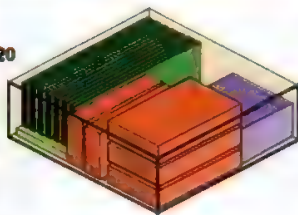
DT 386SX-20

Diamond Technologies,
17155 Von Karman
Ave., #103,
Irvine, CA
92714;

800-989-7253, 714-252-1008.

List Price: With 1MB RAM, 16K processor RAM cache, 1.2MB or 1.44MB floppy disk drive, VGA monochrome display subsystem, \$1,099; with 4MB RAM, 100MB hard disk, Super VGA display subsystem, DOS 4.01, \$2,084; with 1.2MB and 1.44MB floppy disk drives, \$2,179.

In Short: The DT 386SX-20 is a good mail-order option when you are shopping for bargain SXs. Though the list of options is not extensive, the discounts are. Diamond Technologies compensates for the lack of on-site service by offering a one-year warranty on parts and two years on labor.



CIRCLE 402 ON READER SERVICE CARD

fers no other caching options. On the system board are seven expansion slots, including two 8-bit slots and five 16-bit slots. Two of the seven slots in our tested unit were occupied by the video and IDE controller cards. A maximum of 16MB of 80-nanosecond page-mode SIMMs may be added to the system memory in 1MB increments. The system board also has a socket for an 80387SX math coprocessor.

Diamond Technologies does not publish memory upgrade prices, so you'll need to do a little shopping when you want to add memory to the system. The unit's bus is rated at 8 MHz. A turbo switch on the front panel lets you toggle between 16- and 20-MHz operation. Diamond provides a simple CMOS system setup feature, and switches on the motherboard control memory and BIOS shadowing.

The DT 386SX-20 provides ample disk expansion space. Diamond has turned two 3.5-inch bays on their side to allow room for three half-height bays. The disks installed for review represented a mixed bag of brand names, as did the components and cards. But all seemed to work well together, since the DT 386SX-20 showed strong, if not stellar, results on PC Magazine Labs' benchmark tests.

The Super VGA display capabilities are supplied by an Orchid Technologies card that employs a Tseng Laboratories chip set. Another fine component is the Quantum hard disk; it tested faster than its rated 18-millisecond access time.

The list of available options is not extensive, but it does include internal and external 2,400-bps modems ranging from \$129 to \$199, DOS 3.3 and 4.01 for \$85 each, IBM OS/2 for \$289, and a brace of network software, cards, and hubs.

Diamond does not offer on-site service for its computers, but it does provide a one-year warranty for parts, two years for labor, and a 30-day money-back guarantee. Diamond also offers free lifetime technical support via its toll-free sales hot line; if the problem is not a simple one, a tech-support staffer will call you back.

The DT 386SX-20's discount pricing and good performance make it a strong SX contender, especially if you don't need on-site service and are willing to go it alone when it comes to enhancements.

ELTECH RESEARCH INC.

Eltech 2200

by Patrick Honan

The Eltech 2200 is a capable fit in almost any business setting. Its small footprint and affordable price make it ideal for use in a small business or home office, and its expansion room gives it the capacity for relatively demanding 32-bit applications.

GREAT PRICE

Eltech Research sells the Eltech 2200 through dealers and through an in-house mail-order division. The mail-order price is \$2,649 for our standard configuration, which includes 4MB of RAM, a 64K RAM cache, a 106MB hard disk, a 1.2MB or 1.44MB floppy disk drive, a Super VGA color display subsystem, DOS 4.01, Microsoft Windows 3.0, and a Logitech mouse. Our unit came with an extra floppy disk drive, which added \$50 to the price.

For those who can get by with less RAM and a smaller hard disk, Eltech's basic configuration, priced at \$1,899, is an excellent value. It is the same as the tested configuration, except that it substitutes 1MB of RAM, a 16K RAM cache, a 40MB hard disk, and monochrome VGA. The only problem with this basic unit is that it uses 256K SIMMs. If you eventually add more RAM, you'll have to remove these SIMMs and replace them with 1MB SIMMs. An Eltech representative said that the company often swaps the 256K SIMMs for customers at no charge,



Eltech 2200, \$2,699.

depending on how old the system is, but there is no firm policy on this. Considering the \$90 price per megabyte for SIMMs, your best bet is to request the 1MB RAM packages in the first place.

Buying directly from Eltech has two advantages that are especially attractive if you're a home or small-business user. Eltech includes one year of free on-site service and a toll-free technical support line. If you buy from a dealer, you may have to purchase a separate on-site service contract—and technical support is provided, but not via a toll-free number.



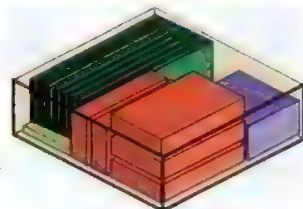
FACT FILE

Eltech 2200

Eltech Research Inc., 47266 Benicia St., Fremont, CA 94538; 800-234-4331, 415-438-0990.

List Price: With 1MB RAM, 16K processor RAM cache, 40MB hard disk, 1.2MB and 1.44MB floppy disk drives, VGA monochrome display subsystem, DOS 4.01, Microsoft Windows 3.0, \$1,899; with 4MB RAM, 64K processor RAM cache, 106MB hard disk, 1.2MB or 1.44MB floppy disk drive, Super VGA color display subsystem, \$2,649; with 1.2MB and 1.44MB floppy disk drives, \$2,699.

In Short: The \$2,649 standard configuration is a good value, especially with Windows 3.0 and one year of on-site service thrown in. Inside this small-footprint unit is room for enough RAM, expansion boards, and disk drives to satisfy even the most demanding user.



CIRCLE 403 ON READER SERVICE CARD

COMPUTERS

20-MHz 386SX PCs

IMPRESSIVE EXPANSION ROOM

The 2200 measures 6.5 by 16 by 16.5 inches, making it a tidy little bundle on your desk. Despite its diminutive case, the 2200 has more room for expansion options than many other small-footprint systems. There are three half-height drive bays and two 3.5-inch bays. All are accessible from the front panel, allowing you to install not only the typical hard disk and two floppy disk drives, but a tape backup drive and a CD-ROM drive, for example.

The 2200's Mycomp motherboard has eight 16-bit expansion slots. Six of these were available on our review unit, to Eltech's credit; other small-footprint units typically have only four or five slots available. It may seem as if you'll never be able to fill the expansion room, but add a controller board for a tape drive or CD-ROM, an internal modem, and a network adapter card, and you'll appreciate the extra space.

Eltech doesn't skimp in other areas of system design either. The 200-watt power supply is more than adequate for the power demands of an SX-based machine. (One shortcoming: The power supply has only four device connectors, but Eltech provides a Y splitter free of charge.) RAM is expandable on the motherboard to a maximum of 16MB using 4MB 80-nano-second SIMMs. The 64K RAM cache uses 20-ns. SRAMs. Optional cache sizes of 16K and 32K are also available.

The cache may have been a factor in placing the 2200 among the faster 20-MHz systems we tested. It finished fifth on the 80386 Instruction Mix test, for example, but was only 0.08 seconds slower than the fastest unit. It was in the slower half of the units on the Floating-Point Calculation test but it had the fastest time on the Conventional Memory test. In contrast to the strong processor scores, the system's relatively slow 25-millisecond Toshiba hard disk placed next to last on the large-record DOS File Access and BIOS Disk Seek tests.

The 2200 we tested came with a Diamond Computer Systems Super VGA board, which is based on the Tseng Laboratories chip set, and a 14-inch Super VGA Mag Computronics PMV-1448 monitor. These components performed quite well on our video tests—tying for second on the Video BIOS Routine Without Scrolling test, and scoring second place on the Video BIOS with Scrolling and Direct to Screen tests.

Other systems may be slightly faster or

more affordable than the Eltech 2200, but few offer the overall value. Couple the speed and price with the excellent service and support options available on mail-order purchases and the 2200 is a winner.

LEADING EDGE PRODUCTS INC.

Leading Edge
D3/SX20c

by Patrick Honan

Average. The word comes to mind often when examining the Leading Edge D3/SX20c. Unfortunately, average doesn't cut it these days. There are better buys, regardless of whether price or perform-



Leading Edge D3/SX20c, \$3,874.

ance is your most crucial buying factor.

The price of the D3/SX20c in *PC Magazine's* standard configuration is \$3,874, including 4MB of RAM, a 32K cache, a 105MB hard disk, 1.2MB and 1.44MB floppy disk drives, an ATI Super VGA board and VGA monitor, DOS 4.01, GW-BASIC, and *Microsoft Windows 3.0*. A dealer discount of 25 to 30 percent would bring the street price to about \$2,800. This price may seem fair, but it's far from the lowest in our review group.

There's a lot of integration on the motherboard, manufactured by Daewoo Telecom, Leading Edge Products' parent company. The I/O ports and hard and floppy disk drive controllers are built-in, and the Super VGA board plugs into a proprietary connector on the motherboard; this leaves all four of the system's 16-bit slots open.

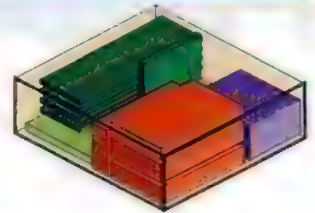


FACT FILE

Leading
Edge
D3/SX20c
Leading
Edge
Products
Inc., 117
Flanders
Rd., Westborough, MA; 800-874-3340, 508-
836-4800.

List Price: With 2MB RAM, 32K processor RAM cache, 1.2MB and 1.44MB floppy disk drives, Super VGA adapter, monochrome VGA monitor, mouse port, DOS 4.01, GW-BASIC, *Microsoft Windows 3.0*, \$2,314; with 4MB RAM, 105MB hard disk, Super VGA adapter, VGA color monitor, \$3,874.

In Short: The Leading Edge D3/SX20c is a middle-of-the-road performer in virtually all important areas: price, expandability, and speed. One major shortcoming is the \$2 charge per minute for technical support.



CIRCLE 404 ON READER SERVICE CARD

Four open slots on an SX system is typical, but keep in mind that some computers in our roundup have as many as six.

You can install two internal half-height drives, one 3.5-inch drive, and one third-height drive. The 3.5-inch bay mounts vertically and is not accessible from the front of the unit. The review unit came with a 1.2MB floppy disk drive in the third-height bay and a 1.44MB floppy disk drive in the half-height bay. Leading Edge also chose a 3.5-inch hard disk, the 105MB Quantum ProDrive LPS. The D3/SX20c's available bays should be sufficient if you are looking to run standard DOS applications and don't use many files. You'll need a system with more storage bays if you want to add a tape drive or CD-ROM drive.

Leading Edge offers only two additional hard disk options, 40MB and 52MB, at \$400 and \$600. Two additional monitors, a low-resolution monochrome monitor and a VGA monochrome monitor are also available. The ATI Super VGA board is the only video board offered.

The 4MB of RAM on the tested unit can be expanded to 8MB on the motherboard using interleaved 1MB 80-nano-second SIMMs. You can add a further 8MB of 16-bit RAM by installing a memory expansion board in one of the expansion slots. Leading Edge offers one processor RAM cache size: 32K of 20-ns. SRAM.

If you have limited space or plan to keep the unit in full view, you'll appreciate the stylish design and trim 5.3- by



BENCHMARK TESTS: 20-MHz 386SX-BASED PCs

No single computer distinguished itself among the rest, though the CompuAdd 320sc sailed ahead on overall performance; it was among the fastest machines on virtually every test.

In testing nine 20-MHz 80386SX computers, we used PC Magazine Labs' Hardware Performance Tests, Release 5.6, with video and system shadowing enabled wherever possible, and we left the buffers at their default values. We used no software disk caches when performing disk benchmark tests, and no RAM-resident programs were loaded for any tests.

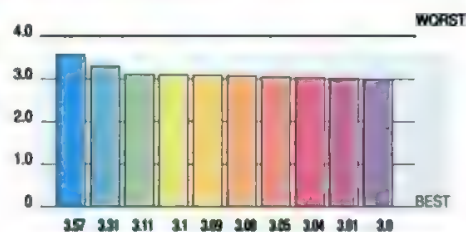
The margin of error for the processor, memory, and video benchmark tests is 0.05 seconds, so take this into account when making purchasing decisions based primarily on speed.

PROCESSOR AND MEMORY BENCHMARK TESTS

80386 Instruction Mix

Elapsed Time (seconds)

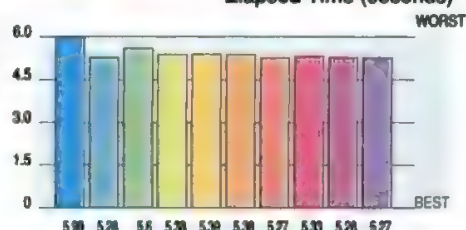
The **80386 Instruction Mix** benchmark test times a series of tasks specific to the 80386 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.



Floating-Point Calculation Without Coprocessor

Elapsed Time (seconds)

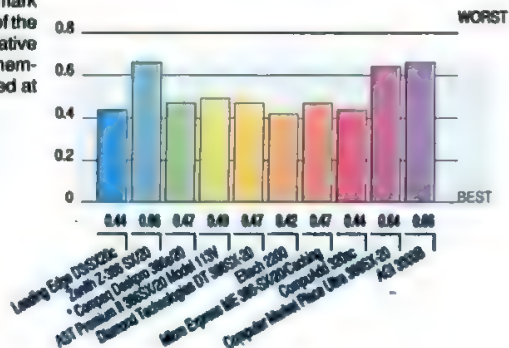
The **Floating-Point Calculation Without Coprocessor** benchmark test sets up a floating-point emulation program in RAM and then exercises the processor and tests RAM access speeds during floating-point calculations.



Conventional Memory

Elapsed Time (seconds)

The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower relative times can indicate the presence of memory wait states or memory chips rated at slower access speeds.



* Reported for comparison.

15.4- by 15.9-inch dimensions. Leading Edge adds some welcome ergonomic touches by putting the power switch and keyboard port on the front panel. The only drawback is that if you take the cover off, it's tricky to get the power switch and reset button to align with the corresponding openings on the front panel when you close things up.

The D3/SX20c was one of the slower units reviewed. In fact, it had the slowest timings on the 80386 Instruction Mix and Floating-Point Calculation tests, and the second-slowest time on the Video BIOS Routine with Scrolling. Its disk scores were mixed.

The warranty on the D3/SX20c is ac-

tive for 20 months—better than the one-year coverage found on most systems. While this is a definite plus, the technical support is a major minus. Leading Edge provides phone support through a 900 number that costs \$2 per minute. Many other manufacturers provide a toll-free support number, and those that don't generally won't charge you for *their* connect time.

The Leading Edge D3/SX20c does include *Microsoft Windows 3.0*. But this and a long warranty cannot make up for relatively limited expansion capabilities and average-to-slow performance. You'll spend less money for more computer elsewhere.

MICRO EXPRESS

Micro Express ME 386-SX/20/Caching

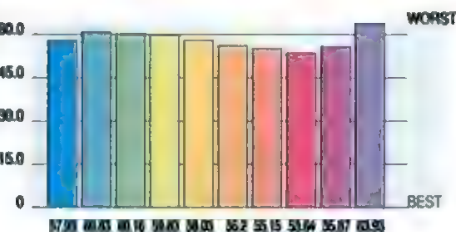
by John R. Quain

The ME 386-SX/20/Caching is the progeny of two other Micro Express PCs: the 16-MHz ME 386SX, which garnered an Editors' Choice in August 1990, and an early version of the ME 386-SX/20/Caching, reviewed in *PC Magazine*, November 27, 1990. The offspring may look the same, but underneath there's a new motherboard, a new chip set, and a new BIOS. Better yet, there's a new and lower price.

DOS File Access (Small Records)

Elapsed Time (seconds)

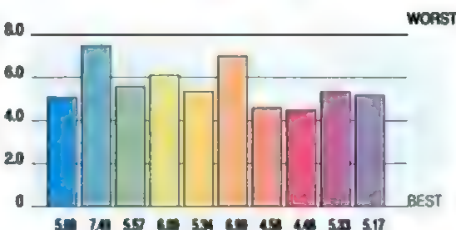
The DOS File Access (Small Records) benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. The test is performed without software disk caching. Fast times are advantageous for programs that work with many short segments of data.



DOS File Access (Large Records)

Elapsed Time (seconds)

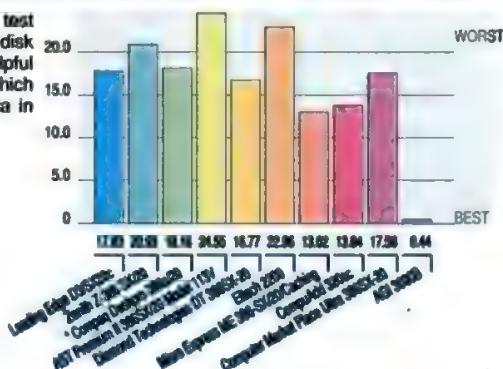
The DOS File Access (Large Records) benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. This test minimizes the effect of small hardware caches on disk subsystem performance. It is performed without software disk caching. Fast times are advantageous when large files are loaded.



BIOS Disk Seek

Elapsed Time (milliseconds)

The BIOS Disk Seek benchmark test measures mechanical track-to-track disk drive access times. Fast times are helpful with programs such as databases, which often store and must later find data in many separate places on a drive.



* Reported for comparison.

In our standard configuration, the new ME 386-SX/20/Caching is the lowest-priced 20-MHz SX in this roundup. For a complete setup, including 4MB of SIMM RAM, 16K of processor RAM cache, a 200MB IDE hard disk, one floppy disk drive, a Super VGA display subsystem, and DOS 4.01, the charge is a mere \$2,364. The configuration we tested, with an additional high-density floppy disk drive, costs just \$85 more. And the basic configuration, with 1MB RAM, no hard disk, and VGA monochrome video, costs just \$1,047. You won't find discounts on these prices, however, because Micro Express deals directly through the mail.

The main reason for changing the inte-

rior of the ME 386-SX/20/Caching was the previous model's inability to access more than 8MB of RAM. You had to install a slower memory expansion card if you wanted more than 8MB. The new motherboard allows for as much RAM as DOS can handle—16MB. But beware: If you think you'll go above 8MB in the future, be sure to start with larger SIMMs (at about \$100 per megabyte) or you'll end up tossing out your older 256K modules to reach the limit.

Popping the top on this machine exposes its revamped design. There are only seven expansion slots versus the usual eight, but by stringing the



PROCESSOR, MEMORY, AND DISK BENCHMARK TESTS: COMPOSITE VIEW

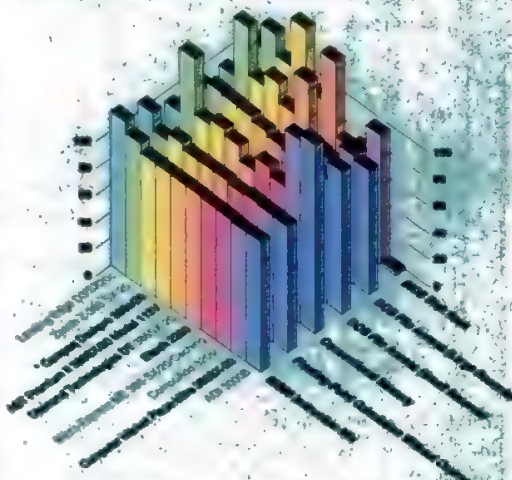
Processor RAM cache is the rule among the computers we reviewed, with all systems having at least 16K. For comparison, we are reporting test scores for the Compaq Deskpro 386s/20 (which we reviewed in *PC Magazine*, November 27, 1990); its performance with 4K of processor RAM cache, was generally equalled or surpassed on processor tests by the 20-MHz 386SXs we examined this time. A notable exception was the Leading Edge D3/SX20c, which had a comparable Conventional Memory test performance but a lagging processor.

Cache RAM played an important role in keeping the AGI 3000B, the Computer Market Place Ultra 386SX-20, and the Zenith Z-386 SX/20 competitive on the Floating-Point Calculation test despite very slow Conventional Memory test results. Unlike the others, these three systems use discrete integrated circuit arrays rather than a large-scale integrated controller to manage cache.

The CompuAdd 320sc and the Micro Express ME 386-SX/20/Caching performed best on our disk tests. The CompuAdd was equipped with a 200MB Seagate IDE hard disk rated at 19 milliseconds, which makes its 13.84-ms. BIOS Disk Seek time all the more impressive. The Micro Express system, with its 200MB Maxtor IDE disk rated at 17 ms., fared almost as well on these tests.

The Zenith Z-386 SX/20 and the AGI 3000B had some of the poorest disk test results. The Zenith's 80MB Quantum IDE hard disk was one of the slowest two on the DOS File Access tests, and the AGI's 132MB Micropolis ESDI disk placed last on our small-record DOS File Access test. The AGI registered an abnormally fast BIOS Disk Seek score because the disk controller's BIOS is written so that the system does not perform a seek. While most caching controllers operate this way on the BIOS Disk Seek test, it is unusual to see a noncaching disk controller's BIOS programmed to behave this way.

Relative Times
(Compaq Deskpro 386s/20 = 100)



* Reported for comparison.

CONTINUES

Put some spring

1990 World Class Award for
Best Mail-Order Company



□ 3 1/2" format available from us. Specify when ordering.
 □ package includes both 5 1/4" and 3 1/2" disks.
 □ 3 1/2" format available from manufacturer by request. Call us for details.
 CP—copy-protected; NCP—not copy-protected.

The four-digit number next to each product is the product's ITEM NUMBER. Please refer to this number when ordering. Thank you.

SOFTWARE

We only carry the latest versions of products. Version numbers in our ads are current at press time. Products listed here in red are Microsoft Windows Applications.

Adobe Systems ... NCP

- 7547 □ Adobe Type Manager for Windows \$59.
- 7928 □ Adobe Plus Pack 119.
- 8367 □ ATM & Plus Pack Bundle 169.
- 7406 □ Adobe Type Cart. 1 (Display Faces) 289.
- 7405 □ Adobe Type Cart. 2 (Best Sellers) . 289.
- 7392 □ Adobe PostScript Cartridge . . . 289.
 (Entire Adobe Type Library, from 1 to 194 is available. Call for more information.)
- Aldus ... NCP**
- 1332 □ PageMaker 4.0 499.
- Alpha Software ... NCP**
- 5104 □ Alpha Four 1.1 319.
- Application Techniques ... NCP**
- 1214 □ Pizazz Plus 2.0. 69.
- Ashton-Tate ... NCP**
- 4450 □ dBASE IV 1.1 499.
- Asymetrix ... NCP**
- 7384 □ Toolbook 1.0 for Windows 309.



Adobe Systems ... NCP

- 7392 □ Adobe PostScript Cartridge—PostScript software for your Ljil. Includes 35 high-quality PostScript outline fonts. \$289.
- Additional PostScript typeface cartridges.
- 7406 □ Cart. 1... 289. 7405 □ Cart. 2... 289.

Avery ... NCP

- 6006 □ Label Pro 1.0 (Laser) \$49.
- 7336 □ Label Pro 1.0 for Dot Matrix 49.

Bitstream ... NCP

- 7568 □ FaceLift 1.0 for Windows 2.x/3.0 . 59.
- 8040 □ FaceLift for WordPerfect 5.0/5.1. . 59.
- 7569 □ Companion Value Pack 1.0 125.
- 8883 □ Type City Cartridge with Deli . . . 259.
- Typeface Packages each 89.
- Bloc Publishing ... NCP**
- 1447 □ FormTool Gold 3.0. 55.
- 9039 □ 3-D CHARTS To Go! 1.0. 59.

Borland International ... NCP

- 7357 □ Turbo C++ 1.0 Professional. . . 209.
- 6242 □ Quattro Pro 2.0 339.
- 1514 □ Paradox 3.5. 529.

Broderbund ... NCP

- 1416 □ New Print Shop Companion . . . 33.
- 1434 □ New Print Shop 39.

Brown-Wagh ... NCP

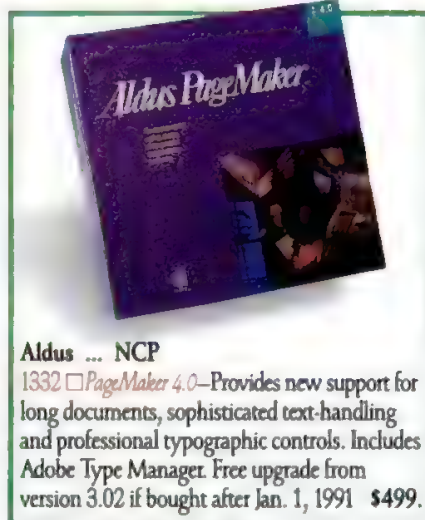
- 8579 □ MicroLogic More Fonts 2.0 75.

ButtonWare ... NCP

- 6419 □ PC-File 5.01 89.

Caere ... NCP

- 6004 □ Omnipage 386 3.0 489.



Aldus ... NCP

1332 □ PageMaker 4.0—Provides new support for long documents, sophisticated text-handling and professional typographic controls. Includes Adobe Type Manager. Free upgrade from version 3.02 if bought after Jan. 1, 1991 \$499.

Central Point ... NCP

- 5039 □ PC Tools Deluxe 6.0. 95.
- 8114 □ Backup 6.0 65.

Checkfree Corporation ... NCP

- 6360 □ Checkfree 19.

Chipseft ... NCP

- 1663 □ TurboTax 8.01 for 1990 Taxes . . . 45.
- State Packages each 34.

- 6221 □ TurboTax 8.01 & Quicken Bundle . 65.

Chronologic Corp. ... NCP

- 8849 □ Instant Recall 1.2. 64.

CompuServe

- 7546 □ DOS Membership Kit 1.2. 23.

Concentric Data Systems ... NCP

- 6575 □ R & R Relational Report Writer 4.0 159.

Coral Systems ... NCP

- 5506 □ CorelDRAW! 2.0 389.

Custom Applications ... NCP

- 8232 □ Freedom of Press Light 2.5 59.

Data Storm ... NCP

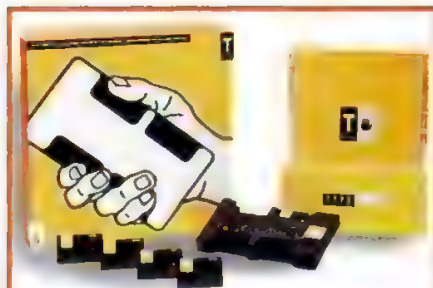
- 4798 □ PROCOMM PLUS 2.0 69.

DCA ... NCP

- 5611 □ Crosstalk for Windows 1.1 125.

Deirna Technology ... NCP

- 9035 □ Winfax 1.0 49.



Bitstream ... 5 years

8883 □ Type City—New high-speed type system for HP LaserJet II, IIP & III—entirely new text & headline faces, & screen fonts for Windows. Expands with add-in cards. *Innocent's Guide to Type* & \$99 Deli card now included free. \$259.

- 4325 □ PerFORM 2.1 95.

- 7351 □ PerFORMPRO 1.0 for Windows . 274.

Digital Research ... NCP

- 8288 □ DR DOS 5.0. 145.

DMA ... NCP

- 8378 □ PC Anywhere IV 4.02. 105.

Fifth Generation Systems ... NCP

- 8103 □ Pyro 1.0. 35.

- 7725 □ Direct Access 5.0. 65.

- 3950 □ Fastback Plus 2.1. 119.

FormWorx ... NCP

- 5810 □ FormWorx with Fill & File 2.5 . . . 85.

- 7311 □ Form Publisher for Windows 1.2. 139.

Fox Software ... NCP

- 6188 □ FoxPro 1.02. 459.

Franklin Software ... NCP

- 7071 □ Language Master 3.0. 49.

- 7416 □ Language Master 3.0 for Windows 49.

Funk Software ... NCP

- 7380 □ P.D. Queue 1.0 (print spooler) . . . 59.

- 2228 □ Sideways 3.3 59.

Geoworks ... NCP

- 8789 □ Ensemble 1.0 129.

Great American Software ... NCP

- 4880 □ One Write Plus Acct. Sys. 2.06 . . 189.

Hayes ... NCP

- 7983 □ Smartcom Exec 2.0 79.



Chronologic Corporation ... NCP

8849 □ Instant Recall! 1.2—Seamlessly ties together deadlines, appointments, addresses, lists, & notes. Gives you the information edge—with integrated viewing, rapid access, multiple search modes, memory-resident option. \$64.

in your PC thing.



Corel Systems ... NCP
 5506 ☐ CorelDRAW! 2.0—The PC graphics software that's fast, fun and powerful. CorelDRAW! 2.0 now comes with more drawing power, more type control, and more value...and it's still easy to use \$389.

- hDC Computer Corp. ... NCP**
 8974 ☐ Icon Designer 1.0 35.
 7389 ☐ Windows Express 3.0 52.
 7383 ☐ First Apps 1.0 52.
Hilgraeve ... NCP
 2323 ☐ HyperACCESS/5 2.0 (DOS & OS/2) 115.
IBM ... NCP
 6599 ☐ Current 1.1 239.
Individual Software ... NCP
 6222 ☐ Resume Maker 1.3 29.
Inner Media, Inc. ... NCP
 8846 ☐ Wide Angle 1.0 69.
Inset Systems ... NCP
 7298 ☐ Hijaak 2.0 99.
 7300 ☐ Inset Plus Hijaak 125.
Insight Development ... NCP
 8320 ☐ PrinTools 1.0 85.
Insight Resource ... NCP
 8851 ☐ KO-Pilot for WordPerfect 5.1 55.
Intuit ... NCP
 2426 ☐ Quicken 4.0 39.



Insight Development ... NCP
 8320 ☐ PrinTools 1.0—Utilities for the HP LaserJet, DeskJet & compatibles. Includes Spooler, Screen Dump, Screen Capture, SetUp, Plot with HPGL/2 support, and Help utilities \$85.

- Isogon ... NCP**
 7478 ☐ FontSpace 2.0 \$59.
LaserGo ... NCP
 7635 ☐ Go Script Plus 3.0 189.
LaserTools ... NCP
 6882 ☐ PrintCache 2.3 99.
Lord Publishing ... NCP
 5191 ☐ Ronstadt's Financials 1.02 75.
Lotus ... NCP
 5417 ☐ 1-2-3 3.1 429.
 5653 ☐ 1-2-3 2.2 349.
 5134 ☐ Magellan 2.0 109.
MECA ... NCP
 4603 ☐ Andrew Tobias' Tax Cut-1990 Taxes 49.
 8884 ☐ MYM & Tax Cut (while supplies last) 129.
Micro Logic ... NCP
 6787 ☐ Info Select 1.1 55.
Microcom ... NCP
 7649 ☐ Virex-PC 1.1 79.
 6234 ☐ CarbonCopy Plus 5.2 119.
Microlytics ... NCP
 8797 ☐ Inside Information 1.0 68.
 7931 ☐ Random House Encyclopedia 68.



Inset Systems ... NCP
 7298 ☐ Hijaak 2.0—Capture screens & convert graphics files with Hijaak release 2.0. New features include 5K pop-up window, many new raster & vector formats and support for more than 16 Group 3 fax devices. \$99.

- Microsoft ... NCP**
 2894 ☐ QuickBasic 4.5 69.
 7010 ☐ Windows 3.0 99.
 7388 ☐ Project 1.0 for Windows 459.
 7882 ☐ Productivity Pack 1.0 for Windows 45.
 2904 ☐ Works 2.0 99.
 2901 ☐ Word 5.0 209.
 7387 ☐ PowerPoint 2.0 for Windows 329.
 6195 ☐ Word 1.1 for Windows 329.
 2856 ☐ Excel 3.0 for Windows 329.
 8137 ☐ Office for Windows (includes Excel, Word for Windows, and PowerPoint) 659.
 2853 ☐ C Compiler 6.0 329.

1-800/243-8088

MMC
Marketing Management Corporation

PC Connection
 6 Mill Street
 Marlow, NH 03456

830M

SALES 603/446-7721 FAX 603/446-7791

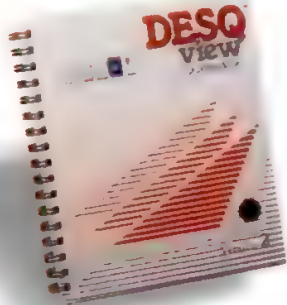


Bitstream ... NCP
 Fast and easy to use, FaceLift scales printer fonts to any size. Includes 13 typefaces to give you professional documents instantly.
 7568 ☐ FaceLift 1.0 for Windows 2.x & 3.1 \$59.
 8040 ☐ FaceLift for WordPerfect 5.0/5.1 59.

- Multisoft ... NCP**
 4925 ☐ PC-Kwik Power Pak 2.0 75.
Nolo Press ... NCP
 5122 ☐ For The Record 2.0 35.
 2982 ☐ WillMaker 4.0 39.
PC Globe ... NCP
 5902 ☐ PC Globe 4.0 39.
 5900 ☐ PC USA 2.0 39.
Personics ... NCP
 4384 ☐ Ultravision 2.0 79.
 7048 ☐ Monarch 1.0 (Data Mgmt. Tool) 319.
PowerUp ... NCP
 7860 ☐ Calendar Creator Plus 4.0 45.
 7861 ☐ Address Book Plus 3.0 49.
 7858 ☐ Express Publisher 2.0 89.
Precision Software ... NCP
 6600 ☐ Superbase 4 for Windows 1.2 429.
Qualitas ... NCP
 7539 ☐ 386MAX 5.1 75.
 7967 ☐ BlueMAX 5.1 for PS/2 (3 1/2" only) 85.
Quarterdeck ... NCP
 6422 ☐ QRAM 1.0 54.
 3221 ☐ Expanded Memory Mgr. 386 5.1 65.
 3220 ☐ DESQView 2.3 85.
 4586 ☐ DESQView 386 2.3 145.
QUE Software ... NCP
 4155 ☐ RightWriter 4.0 54.
Reality Technologies ... NCP
 7891 ☐ WealthStarter 1.0 39.
 6572 ☐ WealthBuilder 1.1 145.
Reference Software ... NCP
 4396 ☐ Grammatik IV 1.0 59.
 7483 ☐ Grammatik for Windows 1.0 59.
Revolution Software ... NCP
 4480 ☐ VGA Dimmer 3.0 (screen saver) 29.
Roykore ... NCP
 8162 ☐ ABC Flowcharter 1.1 189.
Samna ... NCP
 5799 ☐ Ami Pro 1.2 309.
Sitka ... NCP
 6675 ☐ TOPS Network Bundle 3.0 159.
 3720 ☐ Flashcard 2.1 (AppleTalk network card) 155.
Softlogic Solutions ... NCP
 3542 ☐ Software Carousel 5.0 55.

PC CONNECTION®

We've got upgrades



Quarterdeck ... NCP

3220 □ **DESQView 2.3**—Load multiple applications and easily switch between them without exiting and reloading. An easy way to window your current standard DOS applications. \$85.

Software Publishing ... NCP

- 3496 □ Professional Write 2.2. 169.
3482 □ Harvard Graphics 2.3. 329.

Solution Systems ... NCP

- 7977 □ Brief 3.0 (Programmer's Editor). . . 189.

Spinnaker ... NCP

- 3478 □ PFS:First Choice 3.1. 105.
7604 □ **PLUS for Windows 1.0**. 289.

Symantec ... NCP

- 6397 □ The Norton Backup 1.2. 105.
3146 □ The Norton Utilities 5.0. 119.
3425 □ Q&A 3.0. 239.
7999 □ Norton Anti-Virus 1.0. 89.

Systems Compatibility ... NCP

- 8215 □ OutsideIn 1.0. 65.
6564 □ Software Bridge 4.1. 79.

TIMESLIPS ... NCP

- 2987 □ Timeslips III 4.0. 195.
6994 □ PercentEdge 1.0. 69.

Timeworks ... NCP

- 6253 □ Publish-It! 1.1. 139.

Touchstone Software ... NCP

- 7420 □ Check It 3.0. 89.

Traveling Software ... NCP

- 5179 □ LapLink III 3.0. 95.

Ventura Software (Xerox) ... NCP

- 7796 □ Ventura Publisher for Windows 3.0. . 569.

West Lake Data Corp. ... NCP

- 7577 □ PC-FullBak+ 2.0. \$52.

WordPerfect Corp. ... NCP

- 7781 □ LetterPerfect 1.0. 129.
3804 □ WordPerfect 5.1. 265.
6685 □ DrawPerfect 1.1. 279.

WordStar International ... NCP

- 6791 □ WordStar Prof. 6.0. 279.

XTREE ... NCP

- 6161 □ XTree Gold 2.0. 95.

RECREATIONAL/EDUCATIONAL

Accolade ... CP

- 8081 □ Jack Nicklaus' Unlimited Golf. . . 39.

Broderbund ... CP

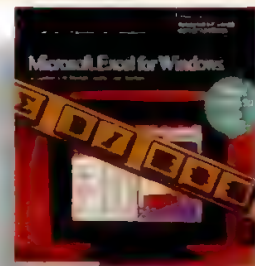
- 8068 □ Where in the World is Carmen
San Diego Deluxe Edition. 52.
5851 □ SimCity. 33.
8886 □ SimEarth. 45.

Electronic Arts ... NCP

- 4534 □ Mavis Beacon Teaches Typing (CP). 35.
7865 □ PGA Golf. 39.

Harvard Associates ... NCP

- 2324 □ PC Logo 3.0. 59.



Microsoft ... NCP

2856 □ **Excel 3.0 for Windows**—Now the best Windows spreadsheet just got better! New features make it even more powerful and easier to use than ever. \$329.

Toyogo ... NCP

- 7676 □ Nemesis Go Master Deluxe. 88.

True BASIC, Inc. ... NCP

- Kemeny/Kurtz Math Series. each 45.

HARDWARE

Warranties listed next to manufacturer.

American Power ... 2 years

- 7108 Smart UPS 400. 339.
7105 Smart UPS 600LS. 469.
6811 360SX (stand-by power source). . . 219.
7106 520ES (stand-by power source). . . 329.

AST Research ... 5 years

- 1299 SixPakPlus 384k C/S/P. 179.
8041 SixPak 286 0k. 99.

Boca Research ... 5 years

- 7001 BOCARAM/AT PLUS (0-8 Meg). . . 119.
7061 BOCARAM/XT 0K (0-2 Meg, LIM 4.0). 99.
6998 I/O Board for AT. 59.
6999 I/O Board for Microchannel (S/S/P). 109.
8380 BasicVGA (256K, 640 x 480). . . . 69.
8381 SuperVGA (1 Meg, 1024 x 768). . . 145.

Bravo Communications ... 2 years

- 7400 2 Pos. Laser Compatible Switch Box. 109.

Brown-Wagh ... 1 year

- 8578 Creative Labs Sound Blaster. 159.

Canon ... 1 year

- 7894 BJ-10e Printer w/free case (4.6 lb.). 349.
9037 BJ-300 Printer (80 column). 549.
9038 BJ-330 Printer (136 column). . . . 649.
7897 BubbleJet Ink Cartridge. 23.

CH Products ... 1 year

- 8119 FlightStick w/Falcon & GameCard III. 79.
7345 RollerMouse (Trackball) serial. 85. bus 99.

Curtis ... lifetime

- 1708 Ruby-Plus SPF-2 Plus. 65.
7358 Command Center. 89.

Glass Filter Plus (specify size) each 65.

Datadek ... 3 years

- 6901 Switchboard. 175.

Epson ... 2 years

- We are an authorized Epson Service Center.
1906 FX-850 (80 col., 264 cps, 9 pin). . . call
1904 FX-1050 (136 col., 264 cps, 9 pin). . call
5183 LQ-510 (80 col., 180 cps, 24 pin). . call
1930 LQ-850 (80 col., 264 cps, 24 pin). . call
1917 LQ-1050 (136 col., 264 cps, 24 pin) call
5184 LX-810 (80 col., 180 cps, 9 pin). . . 185.



TIMESLIPS ... NCP

2987 □ **Timeslips III 4.0**—Perfect for service professionals (i.e. accountants, lawyers, etc.) who need to track & bill their time. . . \$195.
6994 □ **PercentEdge 1.0**—Calculates mortgages, loans, annuities, present values, & more. . 69.

Microsoft ... NCP

- 7881 □ Entertainment Pk for Windows 1.0. 29.
2858 □ Flight Simulator 4.0. 42.
8270 □ Aircraft and Scenery Designer 1.0. 29.

Microsoft Press (Books)

- 8126 Running with DOS 4th Edition. . . . 20.
8129 Running Windows (2nd Edition). . . 22.
8136 Running Microsoft Excel. 22.

Penton Overseas ... NCP

- VocabuLearn/ce Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese). each 35.

Sierra ... CP

- 8146 □ Quest for Glory II. 39.
7972 □ King's Quest V (VGA). 45.

SirTech. ... CP

- 8235 □ Bane of the Cosmic Forge. 39.

Spectrum Holobyte ... NCP

- 5993 □ Welltris. 27.

Software Toolworks ... NCP

- 4659 □ Chessmaster 2100 (CP). 35.
7372 □ World Atlas. 42.

Stone & Assoc. ... NCP

- 5231 □ Phonics Plus 1.1. 22.
3435 □ Letters, Numbers, Words 2.2. . . . 22.

© Realtek

WealthStarter

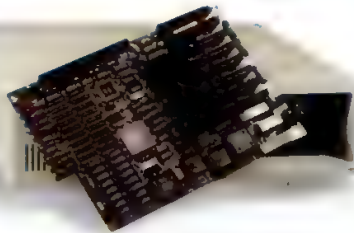
The intelligent, simple and powerful system for real wealth.



Reality Technologies ... NCP

7891 □ **WealthStarter 1.0**—Tired of living paycheck to paycheck? Use WealthStarter to create a budgeting, savings and investing system that really makes the most of the money you make. \$39.

to make it zing.

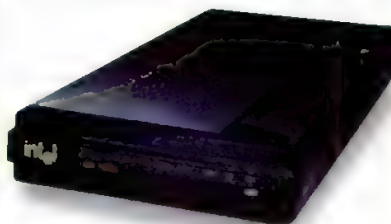


Hauppauge Computer Works ... 1 year
9032 20 MHz 386 Motherboard for XT—Need 386 power, performance, and compatibility? Easily upgrade your PC, XT, AT or true compatible with the Hauppauge Motherboard.
30 day Money Back Guarantee \$995.

- Hauppauge Computer ... 1 year**
9031 20 MHz 386 Motherboard for PC . 995.
9032 20 MHz 386 Motherboard for XT. . 995.
9033 20 MHz 386 Motherboard for AT. . 995.
9034 33 MHz 386 Motherboard for AT. 1399.
Hayes ... 2 years
2307 Smartmodem 2400. 349.
8049 JT Fax 9600B w/Smartmodem 2400 379.
7391 Ultra 9600 Modem 799.
9192 Ethermate 8 (ethernet card). 199.
Hewlett-Packard ... 1 year
7976 DeskJet 500 (with ink cartridge) . . 549.
6582 LaserJet IIP (with toner). 949.
6754 LaserJet III (with toner) 1699.
Intel ... 5 years
6421 2400B MNP Internal Modem . . . 199.
4696 2400B Internal Modem 149.
5119 2400 Baud External Modem . . . 179.
6420 2400EX MNP Modem. 229.
7880 9600EX Modem 549.
2346 Inboard 386/PC with 1 Meg . . . 495.
5336 Above Board Plus 8 2 Meg . . . 549.
5342 Above Board Plus 8 I/O 2 Meg . . 569.
7782 SatisFAXtion (fax board) . . . 399.
8778 SatisFAXtion for Microchannel . . 449.
8901 Matched Memory 2 Meg (PS/2) . . 189.
8903 Matched Memory 4 Meg (PS/2) . . 499.
MATH COPROCESSORS
7385 80287XL (16 MHz 80286 CPU's) . . 199.
4750 80387SX (16 MHz 80386SX CPU's) 309.
2371 80387 (16 MHz 80386 CPU's) . . . 349.
2372 80387-20 (20 MHz 80386 CPU's) . . 399.
4121 80387-25 (25 MHz 80386 CPU's) . . 499.
Kensington Microware ... 1 year
2582 Master Piece Plus 109.
7899 Expert Mouse serial 119. 7900 bus 129.
Keytronic ... 3 years
4518 101 Plus Keyboard 99.
Kraft ... 5 years
5800 3 button Thunder Joystick. 29.
5813 Game Card/Thunderstick Bundle . . 55.
7862 TopTrak (Laptop Trackball). 75.
LaserGo ... 1 year
8534 1 Meg Upgrade for LJII/III. 139.

Logitech ... limited lifetime

- 7768 C9 Mouse with Windows. \$149.
6029 Trackman serial . 85. 6028 bus . 89.
4297 ScanMan Plus (hand scanner) . . 165.
7975 ScanMan 256 319.
8694 MouseMan (serial) 69.
Micron Technology ... 2 years
7595 2 Meg Expansion for HP
LaserJet IIP or III. 159.
7012 Memory Upgrade PS/2 70 - 2 Meg 149.
Microsoft ... lifetime
7597 Microsoft Mouse 89.
2897 Mouse with Paintbrush 105.
2898 Mouse with Windows 3.0 149.
MicroSpeed ... 1 year
PC-TRAC Trackball
6007 serial. 75. 6008 bus. 89.
7271 Inport 79. 6330 PS/2 79.
Mouse Systems ... lifetime
5997 Trackball (1 yr. wmtty.) serial 65. bus 69.
7878 PC Mouse III (bus or serial) 89.



Intel ... 5 years

7880 9600EX Modem—Provides ultra-fast data communications without sacrificing compatibility. Supports V.32 & V.42bis 9600 bps operation, as well as MNP Level/5 and Hayes compatible 2400/1200/300 bps modes. \$549.

NEC ... 2 years

- 4799 Multisync 2A (VGA Monitor) 499.
5085 Multisync 3D Monitor 689.
Orchid Technologies ... 4 years
7863 ProDesigner VGA II with 1 Meg. . . 329.
PC Power & Cooling ... 1 year
REPLACEMENT POWER SUPPLIES
3203 Turbo Cool 200 149.
7915 Turbo Cool 300 165.
3200 Silencer 150 (84% noise reduction) 115.
7053 InnerSource 2210. 349.
Pacific Data Products ... lifetime
6779 25 Cartridges in One! (for LJ II, IIP, III) 275.
8816 PacificType (40 PostScript Typefaces for PacificPage PE 4.0 users). 275.

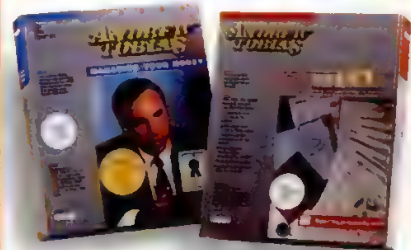
1-800/243-8088



PC Connection
6 Mill Street
Marlow, NH 03456

830M

SALES 603/446-7721 FAX 603/446-7791



MECA ... NCP

8884 Managing Your Money 7.0 with Tax Cut-1990 Bundle—Put Andrew Tobias to work for you with the award winning Managing Your Money and Tax Cut in a special bundle. Available while supplies last. \$129.

- 8975 Complete Font Library (for LJIII) . . 275.
Memory upgrade for LaserJet IIP/III:
7055 2 Meg . . . 169. 7759 4 Meg . . . 279.
7158 PacificPage PE 4.0 (for LJ IIP/III) . . 379.
6834 PacificPage with free 2 Meg
Memory Board (for LaserJet II) . . . 379.
Practical Peripherals ... 5 years
3100 1200 Baud External Modem 75.
3103 2400 Baud Internal Modem 129.
3102 2400 Baud External Modem 179.
8993 2400 Baud Int. Modem (V.42 bis) . . 169.
8994 2400 Baud Ext. Modem (V.42 bis) . . 209.
4542 2400 Baud Internal Modem for PS/2 229.
8132 PM2400 Pocket Modem 109.
7934 PM9600SA Modem 489.
PSION .. 1 year
7086 MC600 Mobile Computer 2149.
Reflection Technology .. 1 year
7127 Private Eye (virtual display) 499.
SAFE Power Systems ... 2 years
6747 Safe 400S. 399.



Bloc Publishing ... NCP

9039 3-D CHARTS To Go! 4.0—A Windows 3.0 chartmaker that makes creating 3-D charts a breeze. Enter numbers directly or import from Lotus, Excel or Wingz. Add text, import graphics & change the angle, coloring or shadowing \$59.

Give us a ring.

Targus ... lifetime

6037 Premier Leather Carrying Case... \$199.

TheComplete PC ... 2 years

8082 TheComplete Half Page Scanner/400

w/ReadRight Personal OCR Software 289.

6797 TheComplete Fax Portable 319.

5828 TheComplete Communicator 449.

Tripp Lite ... 2 years

6199 Isobar 4-6 (4 outlets, 6 ft. cord) 49.

6200 Isobar 6-6 (6 outlets, 6 ft. cord) 59.

9193 BC350 (350W Battery Backup) ... 219.

6624 BC450 (450W Battery Backup) ... 269.

7889 BC1200 (1200W LAN Backup) ... 669.

6018 LC1200 (1200W Line Conditioner). 159.

Video 7 ... 7 years

5883 1024i VGA (includes 512k). 199.

4931 VRAM VGA 512k 369.

DRIVES

CD Technology ... 1 year

8057 Porta-Drive CD-ROM 649.

8105 Installation Kit for Standard Bus. ... 95.

8106 Installation Kit for Microchannel .. 249.



Practical Peripherals ... 5 years

7934 PM9600SA Modem—Practical Peripherals does it again by making communications affordable with their newest modem featuring the data compression & error correction of 9600bps V.32 & V.42bis operation. ... \$489.

Conner Peripherals ... 1 year

8875 CP3044 40 Meg IDE HD (25 ms) . 325.

8874 CP3184 80 Meg IDE HD (25 ms) . 499.

8876 CP3104 100 Meg IDE HD (25 ms) . 549.

IOmega ... 1 year

5116 Bernoulli II 44 Meg Internal 995.

7551 Bernoulli II Transportable 44 Meg . 997.

5113 44 Meg Cartridge Tripak (5 1/4") ... 269.

2500 PC2B Controller 209.

Mountain Computer ... 2 years

2917 40-60 Meg Internal Tape Drive ... 259.

5500 83-152M Int. Tape Drive 629.

5190 DC2000 Pre-formatted Cartridges ea. 35.

6153 DC2120 Tape Cartridge (5 pack) . 149.

Pacific Rim ... 1 year

5010 1.2 Meg External (for PS/2's) 215.

6602 1.44 Meg External (for PC/XT/AT) . 239.

Plus Development ... 2 years

6424 Hardcard II 80 Meg (19 ms) 599.

8304 Hardcard II XL 50 Meg (9 ms) 399.

8287 Hardcard II XL 105 Meg (9 ms) ... 689.

Seagate ... 1 year

2286 30 Meg Int. Hard Drive ST238R

(w/controller and cables, 65 ms) .. 269.

4554 40 Meg Int. HD ST251-1 (28 ms) ... 269.

4624 80 Meg Int. HD 4096 (28 ms) 619.

TEAC ... 1 year

4670 1.44 Meg Drive for PC/XT (3 1/2").. \$79.

4326 1.44 Meg Drive for AT (3 1/2") with

Bastech software 99.

4951 720k Drive for PC/XT (3 1/2") 69.

6951 1.2 Meg Drive for AT (5 1/4")..... 89.

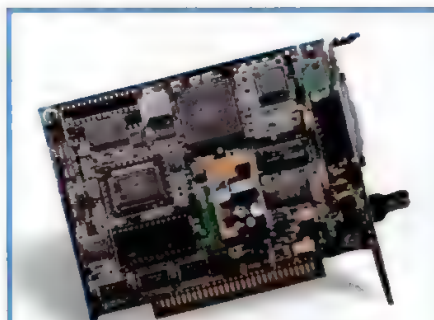
DISKS/MEDIA

Maxell ... lifetime

2789 5 1/4" MD2-D 360k Disks (Qty. 10) 10.

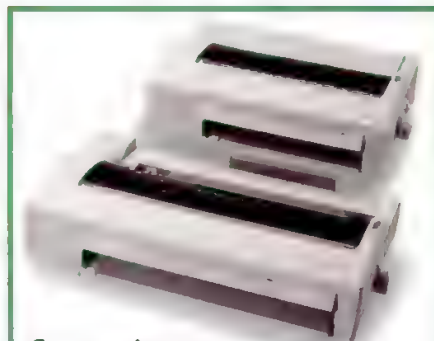
2792 3 1/2" DS/DD 720k Diskettes (Qty. 10) .. 13.

2793 3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10) 21.



Hayes ... 2 years

9129 EtherMax 8-8-bit Ethernet adapter for IBM PC XT/AT, PS/2 Model 25+ 30, and compatibles. Supports Thick Ethernet DB-15 AUI and Thin Ethernet BNC connections \$199.



Canon ... 1 year

These ultra quiet Bubblejet printers offer dazzling print quality to rival lasers at dot-matrix style prices. Advanced paper handling capabilities.

9037 BJ-300 Printer (80 column) \$549.

9038 BJ-330 Printer (136 column)..... 649.

Sony ... lifetime

3291 5 1/4" DS/DD 360k Disks (Qty. 10) 9.

3297 3 1/2" DS/DD 720k Diskettes (Qty. 10) .. 12.

3298 3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10) 19.

6148 3 1/2" DS/DD (3 Pack) 29.

6375 3 1/2" DS/HD (3 Pack) 49.

8185 QD 2040 Tape Cartridge 19.

6712 QD 600A Tape Cartridge 27.

6715 QD 6150 Tape Cartridge 27.

3M ... lifetime

3943 DC 2000 Tape Cartridge 20.

6065 DC 2080 Tape Cartridge 25.

3944 DC 600 Tape Cartridge 29.

5679 DC 6150 Tape Cartridge 29.

MEMORY

6556 256k DRAM (100 ns, set of 9) call

5510 1 Meg x 9 SIMMs (80 nanosecond) call

5746 1 Meg Chips (80 ns, set of 9) call

7813 256k x 4 Chips call

OUR POLICY

- We accept VISA and MASTERCARD only.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
- No sales tax, except Ohio residents (please add applicable tax).
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail.
- International orders U.S. \$250 minimum.
- Upon receipt and approval, personal and company checks clear the same day for immediate shipment of your order.
- COD max. \$1000. Cash, cashier's check, or money order.
- 120 day limited warranty on all products. Defective software replaced immediately. Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice.
- To order, call us Monday through Friday 8:00 AM to 1:00 AM, or Saturday 9:00 AM to 5:30 PM. You can call our business offices at 603/446-3383 Monday through Friday 9:00 AM to 5:30 PM.



Microcom ... NCP

7649 Virex-PC 1.1—Effective, comprehensive solution to DOS-based computer viruses \$79.

6234 Carbon Copy Plus 5.2—Allows you to access and control a remotely located PC. . 119.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:

- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
- For all other items, add \$3 per order to cover UPS Shipping. For such items, we automatically use Airborne Express at no extra charge if you are more than 2 days from us by UPS ground.

Hawaii:

- For monitors, printers, Bernoulli Boxes, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add \$3 per order.

Alaska and outside Continental US:

- Call 603/446-7721 for information.



PC Conservation.

Our favorite multiuser environment. (Or, the greening of Big Blue.)

It's only natural that you'd find some serious environmental awareness here in the pristine preserve of Marlow, NH (pop. 565). After all, we have some pretty nice environment to be aware of. In fact, 90% of Marlow is undeveloped forest and wetlands. And our headquarters are on the banks of the Ashuelot River, a popular white-water rafting stream. So we're making sure our act is as clean as it can be.

For example, we now recycle all our used four-color magazines and catalogs. They are beaten to a pulp and transformed into 100% recycled paper right here in New Hampshire.

We, in turn, use this very same paper as a packing material *instead of those annoying foam peanuts*. Overall, we've cut our waste by over 75% in just one year. And, inspired by our down-to-earth mascots, we continue looking for ways to do more (with less), and encourage our vendors to do the same.

The Four Rs: Reduce, Re-use, Recycle, Raccoon.

You'll find it easy to stow it, not throw it when carrying your very own PC Connection insulated lunch bag and re-usable string shopping bag. You won't ever want to leave home without them. They're both free when you place an order of \$750 or more between now and June 30.



Save paper by packing it in PC Connection lunch and shopping bags! One per customer.

PC CONNECTION

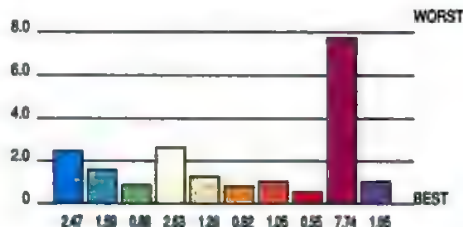


BENCHMARK TESTS: 20-MHz 386SX-BASED PCs

Direct to Screen

Elapsed Time (seconds)

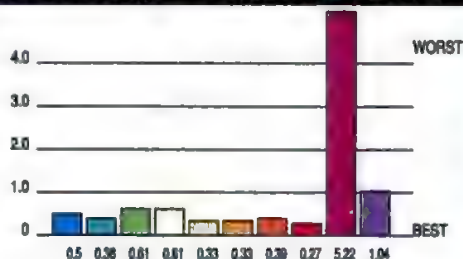
The **Direct to Screen** benchmark test indicates the speed of the video adapter memory. Good scores indicate that information can get to the screen quickly, particularly for programs that avoid the computer's BIOS and go directly to the screen.



Video BIOS Routine Without Scrolling

Elapsed Time (seconds)

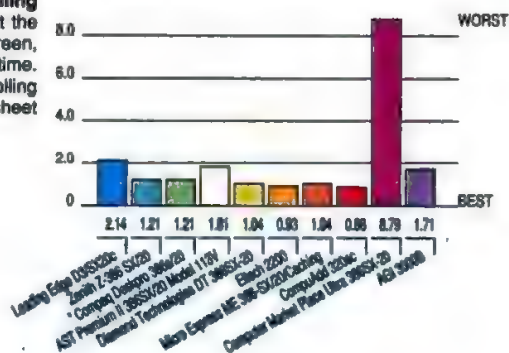
The **Video BIOS Routine Without Scrolling** benchmark test measures how quickly the BIOS on the video adapter writes text data to the screen. Fast video writing helps with programs that show full or partial screens of data without scrolling the screen.



Video BIOS Routine with Scrolling

Elapsed Time (seconds)

The **Video BIOS Routine with Scrolling** benchmark test measures how fast the video adapter can scroll the screen, moving the display up one line at a time. Good performance is helpful for scrolling through word processing or spreadsheet files.



* Reported for comparison.

one parallel and two serial I/O connections off the motherboard and into holes punched in the back of the case, the vendor has preserved good potential for expansion. With Micro Express's 1,024-by-768 card installed, there are still six open 16-bit expansion slots; this beats some other systems in our roundup by two slots.

On our tested system, the 200MB Maxtor hard disk was mounted on the side of the floppy disk drive bays. This left enough room for three half-height drives and one 3.5-inch drive, but it truncated one of the machine's seven expansion slots. With the video card installed, there

were actually five and a half slots open. Still, if you shift the video board to the half-length slot, you'll have six full-length slots available.

SLOPPY CONSTRUCTION, HIGH SCORES

We performed this simple operation and found the small motherboard solid enough. But the unit's assembly left a little to be desired. When we removed the video card from its slot, the whole motherboard lifted about half an inch out of its moorings in the chassis. A fastening screw had been

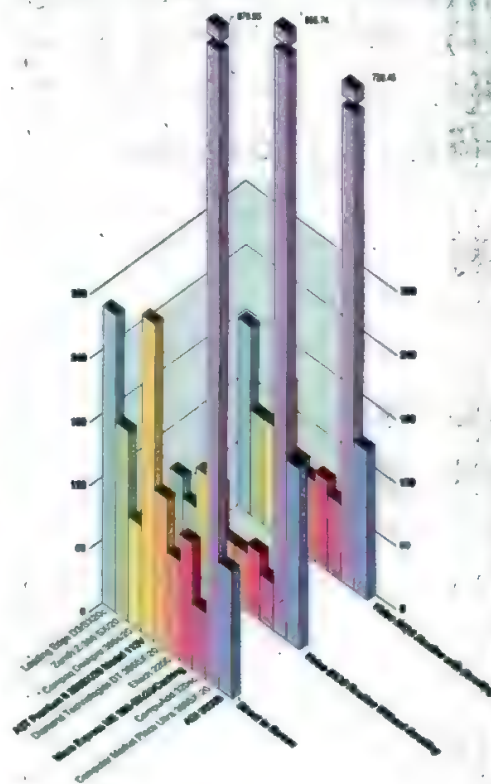
VIDEO BENCHMARK TESTS: COMPOSITE VIEW

The CompuAdd 320sc's motherboard-mounted Super VGA system, with a Tseng Laboratories video chip, performed best in the video arena.

Two factors impaired the Computer Market Place Ultra 386SX-20 and its Renaissance video board on this group of tests. Normally, this board is very fast, but at PC Labs we conduct our tests without any of the video drivers loaded. Also, while a pass-through VGA connector is available, the 16-bit board came in a piggyback-connection configuration that limited its performance to 8-bit operations. With video drivers and the correct cabling installed, you can expect an appreciable increase in its performance speed.

Relative Times

(Compaq Deskpro 386/20 = 100)



* Reported for comparison.

ENDS

The Ultimate...

Screen Capture and Print Software

You know how much time you spend in the creation of perfect graphic images. Ones that display your views, ideas, and creativity. Well, don't stop at the screen. *Pizazz Plus* will take your screen based images and print them anywhere and anyway you want, as well as create files directly compatible with any popular desktop publisher. With *Pizazz Plus*, you can capture the entire screen or isolate a section. Adjust size, proportion, rotation, or placement on the page. You will see more detail and texture in your B&W prints

Pizazz Plus Compatible Hardware

Computers: IBM PS/2, PC, XT, AT, or compatible

Display Adapters: IBM VGA, MCGA, EGA, CGA, 8514A and others

Extended VGA Display Adapters:

Video Seven FastWrite VGA and V-RAM VGA

Image Capture Boards: AT&T

TARGA 16/24/32 and ICB, ATronics PIB and PIB+, Vision Technologies Vision 16 EV-680

Printers: *Pizazz Plus* supports over 300 different printer models from the following manufacturers:

Adobe Systems, ACER, Alps, AMT, Anadex, Apple, AST, AT&T, Brother, C. Itoh, CalComp, Canon, Centronics, CIE, Dataproducts, DEC, Diablo, Diconix, Epson, Genicom, Hewlett Packard, IBM, IDS, Infoscrite, JDL, Kyocera, Laser Connection, Mannesmann Tally, NEC, Newbury Data, Oasys, Okidata, Panasonic, Printronix, QMS, Quadram, Qume, Seikosha, Sharp, Star Micronics, Tandy, Tektronics, TI, Toshiba, Transtar, Unisys, Xerox, Wang

Call for additional information including a complete list of supported hardware.

and desktop publishing files with up to 256 shades of gray. For color printers, your prints will come to life with a rainbow of print shades and options.

What you see is just the beginning. Since the introduction of *Pizazz* (PC World "Software Hits of 87"), it has been without question the best tool available for the reproduction of screen based graphics and/or text.

The bottom line is, if it looks good on your screen, it will look good when

printed or merged into your report, brochure, or presentation. *Pizazz Plus* doesn't just print images, it pushes your printer to its maximum capability to produce a masterpiece. And, it's memory resident—your image is never more than a keystroke away from professional printing or importing into your desktop publisher.

PC
MAGAZINE
EDITORS'
CHOICE

April 24, 1990
Pizazz Plus

All images were produced with Pizazz Plus.

Print in vivid color for maximum impact.

The perfect import tool for your desktop publisher.

Pizazz Plus



Only \$149.00, plus \$5.00 shipping and handling.

ORDER TOLL FREE! 1-800/433-5201

For sales support, or in MA, call 508/433-5201

Memory resident program takes as little as 32K. All manufacturer's names or product names are registered trademarks of their respective manufacturer. Screen images courtesy of AT&T and Facet, Inc.



Application Techniques, Inc.

10 Lomar Park Drive, Pepperell, MA 01463
508-433-5201 FAX 508-433-8466

© 1989 Application Techniques, Inc.

CIRCLE 335 ON READER SERVICE CARD



**Micro Express ME 386-SX/20/Caching,
\$2,449.**

forgotten, and one of the corner stan-
chions did not fit neatly into the system
board; this left the board a bit loose in the
case. Otherwise, the entrails of the ME
386-SX/20/Caching looked as they should,
with secure couplings and little cable spa-
ghetti.

Our benchmark tests bore this out.
With only 16K of 32-nanosecond nonex-
pandable RAM caching, the ME 386-SX/
20/Caching was consistently perched in
the top half of this group of 20-MHz SX
machines. Performance differences be-
tween this machine and its earlier incarna-
tion revealed slightly better processor
speed. When compared with the earlier

model's 100MB IDE hard disk, the pres-
ent 200MB IDE hard disk yielded slower
times on the small-record DOS File Ac-
cess and BIOS Disk Seek tests, yet turned
in better performance on the large-record
DOS File Access test. If you're involved
in GUI and graphics work, you should
also note that the new ME 386-SX/20/
Caching posted video times considerably
faster than the earlier model.

In fact, the video card with its Tseng
Laboratories chip set should satisfy your
needs, but the supplied TVM SuperSync
3A monitor may not; this 14-inch, 0.28-
millimeter-dot-pitch Super VGA monitor
failed to impress us. It was adequate for
most computing needs but manifested a
slight amount of pincushioning (bulging
of straight lines).

In the climb toward better service,
Micro Express offers a 15-month parts-
and-labor warranty. To assuage mail-
order-customer fears, the company will
also pay full shipping costs for the first
four months, after which it will still pick
up the tab to return a repaired unit to you.
Micro Express offers no on-site service,
but if you have a board problem, the
company will send a new one to you
overnight.

If you are a single user desiring con-
venience, the Micro Express ME 386-SX/
20/Caching may be the computer you're
looking for. Keeping in mind our caveats
about the loose assembly and mediocre
monitor, this machine's rock-bottom price,
solid performance, and respectable small-
footprint expansion space make it worth
your attention.

ZENITH DATA SYSTEMS

Zenith Z-386 SX/20

by Greg Pastrick

Zenith's small-footprint 20-MHz 386SX
has the burden of competing against sim-
ilar machines that are mostly faster and
less expensive. So where does the Z-386
SX/20 make its mark? It had better excel
on features and options, and this Zenith
machine scores strong points with both.

For a configuration that approximates
our standard, Zenith charges \$4,598. This
computer (Model 80) comes with 4MB of
RAM, 32K of processor RAM cache, a
hard disk with only 80MB, one floppy
disk drive, a VGA display card and mono-



Zenith Z-386 SX/20, \$5,597.

chrome VGA monitor, DOS 4.01, and
Microsoft Windows 3.0, which includes
Asymetrix's *ToolBook*, Version 1.0, and
a Microsoft serial mouse. With its top-of-
the-line color VGA monitor added, Ze-
nith asks \$5,597. Zenith also offers a basic
configuration (Model 40) with 2MB of
RAM and a 40MB hard disk for
\$3,499—and a similar Model 80 (with the
80MB hard disk) for \$3,999.

The Z-386's performance is a matter
of perspective. Among the tight group in
this review, the Z-386's Instruction Mix
and memory test scores are slow. But
compare them with the group of 20-MHz
SXs we reviewed in our issue of Novem-
ber 27, 1990, and the Z-386's timings
seem remarkable. Obviously its proces-
sor RAM cache has a strong effect. Our
BIOS Disk Seek test showed the 80MB
Quantum IDE hard disk running almost 2
milliseconds slower than its rated 19-ms.
access time. But the video scores achieved
by the 16-bit VGA card with its Headland
chip set were more competitive with the
nine other machines in the group.

The Z-386 is a well-designed machine.
System setup is controlled from the key-
board. You can set the bus speed at either
6.77 or 10 MHz, speeds that Zenith labels
"compatible" and "fast," respectively.

Password control, port enabling, and
video BIOS shadowing are all accessed in
the setup screen. The baby-AT mother-
board with its five-slot backplane leaves
all components and open sockets acces-
sible. And all the 16-bit slots have full-
length clearance. With one of those slots
taken by the VGA video card, the Z-386 is
left with four usable expansion ports.

A math coprocessor socket is ready



**Micro
Express
ME 386-
SX/20/
Caching**
Micro
Express,
1801
Carnegie

Ave., Santa Ana, CA 92705; 800-642-7621,
714-852-1400.

List Price: With 1MB RAM, 16K processor
RAM cache, 1.2MB or 1.44MB floppy disk
drive, VGA monochrome display subsystem,
\$1,047; with 4MB RAM, 200MB hard disk,
Super VGA color display subsystem, DOS
4.01, \$2,364; with 1.2MB and 1.44MB floppy
disk drives, \$2,449.

In Short: An updated design means more free
expansion slots (six), room for more RAM on
the motherboard (32MB), and a slight
improvement in performance. In the light of its
very reasonable price, this machine should not
be overlooked.

CIRCLE 405 ON READER SERVICE CARD



THE WINDOWS™ 3.0 SOLUTION: Microway's FASTCache-SX™ replaces your Intel® 286™ with a 386™SX that triples your speed for just \$495!

FASTCache-SX is your most cost effective upgrade path to the world of 386-based computing. Designed to work in most ATs and compatibles, Microway's FASTCache-SX converts your 286 into a true 386SX powerhouse that outperforms all 386SX-based systems we've tested to date. You'll be able to run all your old 16-bit software plus new applications customized for the 386's speed and 32-bit memory, like Windows 3.0 in "386 enhanced mode." And, it's 100% compatible with your AT's hardware and software.

Speed ... Memory ... Compatibility

Its large, four-way set associative cache gives your AT zero-wait-state performance accessing 16-bit memory. Most of your

- Features a genuine Intel 80386SX running at either 16 or 20 MHz.
- Quick and easy installation with our user friendly manual.
- Includes state-of-the-art four-way set associative 32K cache (optional 64K).
- Runs Windows 3.0 in "386 enhanced mode," DESQview-386, and OS/2.
- Landmark ratings of 21.3/27 MHz and Norton SI ratings of 18/22.4 at clock frequencies of 16/20 MHz.
- Outperforms all other 386SX-based motherboards and accelerators!
- Running with an optional Intel 80387™SX, FASTCache-SX delivers 5 to 10 times the numeric throughput of your old AT—up to 1.7 MegaWhetstones—making it ideal for boosting the speed of AutoCAD, Lotus 1-2-3, and PostScript interpreters such as Freedom of Press.

applications will run two or three times faster, providing the equivalent performance of more expensive 386/387DX-based systems. FASTCache-SX/16 gives you the power to run 386-specific multitasking programs on your AT or compatible for just \$495, plus cable!

No Risk Offer: FASTCache-SX comes with an unconditional, 30-day, money back guarantee and a 5 year warranty. Your complete satisfaction is guaranteed — or your money back!

Call (508)746-7341 to order your FASTCache-SX today!



Microway®

Corporate Headquarters,
P. O. Box 79, Kingston, MA 02364 USA
TEL 508-746-7341 • FAX 508-746-4678

U.K. 32 High St., Kingston-Upon-Thames, 081-541-5466
Norway 9 876656
Holland 40 836455
Italy 02-74.90.749
Japan 81 3 222 0544

286, 386, 387 are trademarks of Intel Corp.
Windows is a trademark of Microsoft.
FASTCache and Microway are trademarks of Microway, Inc.

COMPUADD 320SC:

CompuAdd Makes the Fastest 386SX Faster!

Built-in parallel port and two serial ports

Three 16-bit and two 8-bit expansion slots

Built-in dual 10MB hard drive controller

CompuAdd's high-speed cache memory. Must be purchased separately. Price \$199.95.

COMPUADD 320SC

32KB (expandable to 64KB) high-speed cache memory retrieves most frequently used data at 0 wait-state

Built-in dual diskette controller

COMPUADD 320SC

386SX MEMORY CACHING

The Secret? Cache Memory!

\$1295⁶⁶⁷²⁰

The NEW 386SX-based CompuAdd 320sc dramatically boosts throughput speed for vital business projects like spreadsheets and databases! CompuAdd engineers designed a completely new system board that couples a powerful 20MHz Intel® 386SX micro-processor with 32KB high-speed cache memory!

The CompuAdd 320sc zips through memory-intensive applications because the microprocessor retrieves the most frequently used data from

high-speed cache memory rather than from the hard disk.

The new design incorporates CompuAdd's Hi-Rez VGA controller into the system board to deliver video performance worthy of the fastest SX systems! Since the controller is built on the system board, you get incredible high-resolu-



Optional monitor may differ from that shown.

tion video without using an expansion slot!

Call toll-free today and find out how affordable our fastest 386SX computers can be!

CompuAdd 320sc Features:

- 80386SX™ rated at 20MHz
- 1MB DRAM expandable to 32MB
- 0 wait-state memory
- 32KB cache memory
- ROM shadowing, EMS LIM 4.0 support and disk caching
- 5.25" 1.2MB or 3.5" 1.44MB high-density diskette drive
- Hi-Rez VGA controller incorporated on system board
- Dual diskette controller
- Dual IDE hard drive interface
- Three full-sized 16-bit and two half-sized 8-bit slots
- One 5.25" and two 3.5" half-height drive bays
- 387SX math coprocessor socket
- One parallel port and two serial ports
- 101-key enhanced keyboard
- Real-time clock/calendar
- 145-watt power supply
- MS-DOS, OS/2, SCO XENIX, UNIX and Novell compatible
- FREE CompuAdd Windows 3.0
- FREE Microsoft Windows Working Models with hard drive purchase

CompuAdd 320sc Base System:

66720 - \$1295

Lease as low as \$47/mo.

320sc Monitor and Hard Drive Options

	MGA	High-Res. VGA*
40MB	66724 - \$1859	66825 - \$2129
80MB	66725 - \$2129	66826 - \$2399
110MB	66726 - \$2229	66827 - \$2499

* CompuAdd Hi-Rez VGA function incorporated on system board.



Call Today for a Free Catalog!

AST Launches The World's Fastest Fully-Upgradeable 386SX/20.

With its lightning speed, space-saving size and exclusive Cupid-32™ upgradeability, the new AST Premium® II 386SX/20 is right on target when it comes to shooting down the competition.

Powered by a 20 MHz, 80386SX™ processor

Compaq and IBM. And at hundreds of dollars less, you'll agree it's also the best value.

The Premium II 386SX/20 is perfect for large corporations seeking a cost-effective replacement for their 286™-based systems. And since its 80386SX processor runs like a full 80386, it can handle all 386-specific software including Windows 3.0. Plus, it packs all the features of its award-winning Premium predecessors into an



What the industry critics think of AST's Cupid-32 systems family: Premium 486SX: 10-PC Magazine Editor's Choice award Jan. 1990; Computer Personalist No. 1 rated 386SX Jan. 1990; PC World (Australia) Test Centre Choice Aug. 1990; Premium 486: 11-PC World Best Buy Oct. 1989 and top scores in InfoWorld's 386-33 comparison tests July 1989; Premium 486: 25-InfoWorld Best In Its Class March 1990

attractive, ergonomically-designed enclosure.

Most importantly, the Premium II 386SX/20

SYSTEM (MODEL)	AST PREMIUM® II 386SX/20 (439)	COMPAQ® DESKPRO® II 386/20 (60)	IBM® PS/2™ MODEL 55 SX (65)
BIOS SPEED (MHz)	80386SX™/20	80386SX/20	80386SX/16
CUPID-32™ UPGRADEABILITY	YES	NO	NO
DIRECT END-USER SUPPORT	YES (TOLL-FREE)	NO	NO
LANDMARK™ RATING	28.7	28.5	15.8
LIST PRICE	\$3,195	\$3,699	\$3,895**

*IBM PS/2 and Model 55 prices include 100MB hard drive. **MSRP. Actual dealer price may vary.

grade, all you do is replace the processor board with an AST FASTboard™. It's that fast and simple. You won't lose time putting files on a new hard drive or moving boards over to a new machine.



Don't settle for second best; get the 386SX that hits the mark every time. The Premium II 386SX/20. For information on AST's family of upgradeable comput-



for a 16- or 20-MHz 80387SX chip, and both are available from Zenith at \$799 and \$849, respectively. Memory expansion is no problem. Up to 8MB of RAM in 80-nanosecond 256K and 1MB SIMMs may be installed on the motherboard, with another 8MB on a memory expansion card bringing the total to 16MB of system memory. Zenith offers 2MB memory upgrades at \$599 each. The system's 32K of 35-ns. discrete-logic processor RAM cache is easily reached and popped off the motherboard, so if you have the \$399, it's no problem to upgrade the cache to 128K.

The 6.1- by 14- by 15-inch case is fitted with some additional security measures beyond password protection: A sturdy table bolt and case lock are located on the back of the unit. The connector for the clicky Alps keyboard is also located at the back. The system's power-on switch is located on the front panel. Zenith's 125-watt power supply isn't up to the standards of the other machines in this review, all of which offer wattages of 200 or more.

The Z-386 comes with a VGA card, and the VGA monitor options are fairly priced, from \$299 for monochrome to \$699 and \$999 for 13- and 14-inch color displays. Zenith's high-resolution 16-inch color VGA monitor lists for \$1,999, and a 1,024-by-768-resolution Super VGA video card lists for \$899.

Zenith offers a standard one-year warranty for carry-in service at authorized dealers. For an additional cost, the company makes available an extended

warranty service that includes on-site support, a toll-free technical support number, and same-day response, with guaranteed next-business-day repairs on the covered system and its components.

Zenith is a well-known and reliable vendor of solidly built PCs and laptops, and the Z-386 SX/20 has tolerable performance, good features, and workable

expansion options, all at a brand-name price. If you're dead set on a name brand and you can find a deep discount, then the Zenith will be worth its price. ■

Karen Best is an assistant editor at PC Magazine. Bruce Brown and Bill O'Brien are contributing editors of PC Magazine. Patrick Honan, Greg Pastrick, and John R. Quain are free-lance writers and frequent contributors to PC Magazine.

SX/NOW!™

Upgrade IBM PS/2 Models 50 & 60

Faster than a 55SX at less than 1/4 the cost!

Performance Ratings	PS/2 Model 50 or 60	A New PS/2 Model 55SX	SX/NOW!™ in your 50 or 60	
			16 MHz	20 MHz
Norton SI	9.8	15.3	17.6	21.5
Landmark	9.8	15.1	23.2	27.8
Dhrystones	1842	2986	3250	3584
Whetstones	36.9 K	58.9 K	69.0 K	83.4 K
Incremental Cost	—	\$3,895	\$895	\$995

80386SX 16 & 20 MHz processor Upgrades from Kingston features:

- ◆ 16 Kbytes of Cache Memory
- ◆ Onboard 16 or 20 MHz Processor Clock
- ◆ Requires NO Expansion Slot
- ◆ 80387SX Math Co-Processor Socket

Call Sigma for Your Upgrade Options.

Σ Sigma Data

P.O. Box 1790
New London, NH 03257

Tel: 800-446-4525
Fax: 603-526-6915

1-Year Warranty and 30-day Money Back Guarantee.
VISA, MC, AMEX, COD and Qualified PO's accepted.

All products & company names are trademarks or registered trademarks of their respective companies.

Upgrade today!!! Call...

1-800-446-4525

Profit from 10 years of experience

FACT FILE

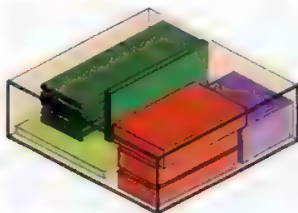


Zenith Z-386 SX/20
Zenith Data Systems,
1501
Feehanville
Dr., Mt.
Prospect,
IL 60056;

800-553-0331, 708-699-4800.

List Price: Model 40, with 2MB RAM, 32K processor RAM cache, 40MB hard disk, 1.2MB or 1.44MB floppy disk drive, VGA monochrome display subsystem, DOS 4.01, Microsoft Windows 3.0, mouse, \$3,798; Model 80, with 4MB RAM, 80MB hard disk, VGA color display subsystem, \$5,597.

In Short: The Zenith Z-386 SX/20, although solidly built, fails to justify its high price, with limited expansion and relatively slow performance. Unless you can find a remarkable discount, mark Zenith off your list.





ZEOS® 386SX-20!

Only \$1595.

COMPLETE WITH A FULL 64K SRAM CACHE!

That's right! Now you can own the incredible new ZEOS 386SX 20MHz system, complete with a full 64K SRAM Cache! Rock Solid '386 computing power. Right now, only \$1595.

Your new ZEOS 386SX-20 includes the most advanced SX motherboard available anywhere. Because we've not only added our high speed 64K Static RAM Cache. We've also integrated the hard and floppy drive controllers *plus* the serial, parallel and game ports *right on the motherboard!* This results in even greater reliability *and* expandability.

ZEOS SX SYSTEMS RATED #1!

After all, the ZEOS 386SX-20 comes from a family of *Editor's Choice* '386 systems. And most recently, in PC Magazine's Service and Reliability issue, ZEOS systems received the #1 SX rating overall. When you receive your new ZEOS 386SX you'll see why ZEOS is #1. Take our case and power supply for instance.

Your new system will include our custom 200 Watt power supply and seven bay SpaceSaver desktop case. You save space and still have room

for lots of future expandability! And the components in your system will last longer too because ZEOS gives you not just one, but *two cooling fans*. After all, the cooler your system runs, the longer it will last. Now that's uncompromising value. That's ZEOS value.

24 HOUR A DAY TOLL FREE SALES AND TECHNICAL SUPPORT!

Too, you will receive our legendary *ZEOS 24 Hour a Day Toll Free Technical Support*. Plus our full 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and Express Parts Replacement Policy.

Performance. Quality. Price. Support. These are the hallmarks that have made ZEOS America's favorite choice. These are the values that make ZEOS your best choice as well. You're going to be *very* satisfied. We don't just say it. *We Guarantee it.*

ORDER NOW TOLL FREE: 800-423-5891

Order your new ZEOS 386SX now with confidence. Your choice of ZEOS quality and performance is Guaranteed. Order now toll free by calling 800-423-5891.

**THE INCREDIBLE
NEW ZEOS
386SX-20 CACHING
SYSTEM. AMERICA'S
#1 CHOICE!**

ONLY \$1595

- Genuine Intel® 80386SX-20 CPU, 8/20MHz.
- Ultra Fast 64K SRAM Cache providing Superior Zero-Wait State performance.
- 512K of Zero-Wait DRAM, expandable to a System Total of 16MB.
- 42MB High Speed IDE hard drive. Teac® 1.2MB floppy.
- ZEOS 14" Hi-Res amber monitor with Tilt/Swivel. Includes Genuine Hercules® brand graphics controller!
- ZEOS/RS 101 key SpaceSaver keyboard.
- Two Serial, one Parallel & one Game Port.
- 6-16, 2-8 bit expansion slots. 80387SX math coprocessor support.
- Rugged ZEOS 7-bay SpaceSaver case with our 200 Watt power supply and two cooling fans for added reliability and product life.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

Options Galore:

Including 14" 1024 VGA, more memory, an incredible selection of hard drives: SCSI, IDE, ESDI or MFM and virtually any other add-on you could want. Ask about other special money saving packages too.

**ORDER NOW TOLL FREE:
800-423-5891**

FAX Orders: 612-633-1325
In Minnesota: 612-633-4591
Outside US and Canada:
612-633-6131

MasterCard, VISA, Discover Card, Am Exp, Z-CARD and COD.

Open 24 Hours a day,
365 Days a year!

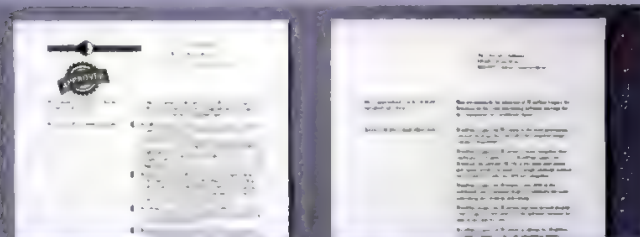
All prices and specifications are subject to change without notice. Please call for current pricing and warranty details. ZEOS is a publicly traded company. NASDAQ Symbol: ZEOS. © 1990 ZEOS International, Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112. All product and company names are trademarks or registered trademarks of their respective holders.

CIRCLE 721 ON READER SERVICE CARD



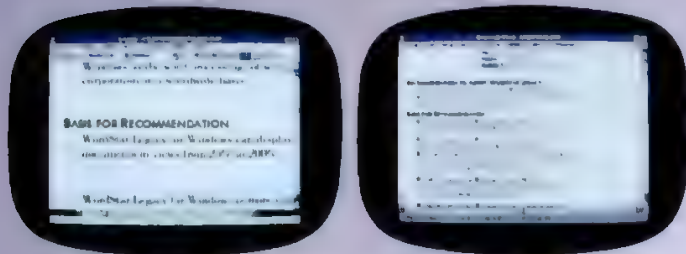
OUR WINDOWS ARE BEYOND WORD'S.

WordStar Legacy vs. Microsoft Word.



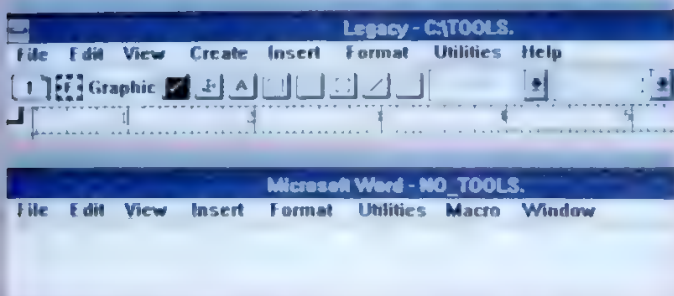
WordStar Legacy is a high end word processor with advanced page layout features. Place text and graphics exactly where you want them.

WordStar Legacy vs. Microsoft Word.



Magnify or reduce multiple, single, fractional pages from 25 to 200%. Edit text, layout or graphics at any magnification.

WordStar Legacy vs. Microsoft Word.



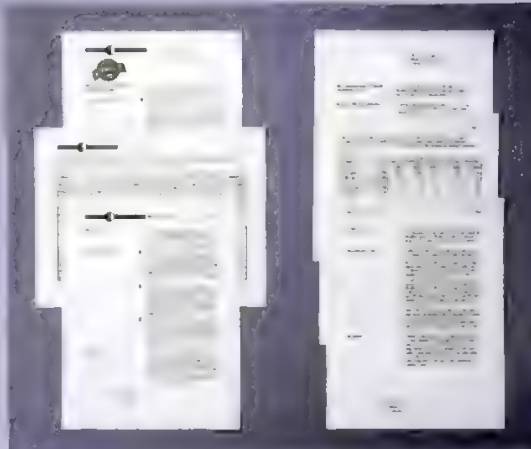
Import nearly every major PC graphics file format. Create, even edit imported object graphics, with built-in Micrografx® tools.

WordStar Legacy vs. Microsoft Word.

Alike Alike

Not all alikes are alike. Now you can kern letters manually or automatically. And specify type sizes in 1/10 point increments between 1 and 792 points.

WordStar Legacy vs. Microsoft Word.



Mix portrait and landscape pages in the same document. And flow text and tables across pages and columns.

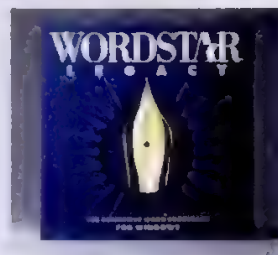
WordStar Legacy is the definitive word processor for Windows. Combining high-end word processing tools with advanced page layout and graphics in one easy to use program, it gives you the ability to create compelling documents.

Because WordStar Legacy is a single program, it's less expensive than buying separate DTP and WP applications, training and support costs are less, and its superior integration, DDE,[™] and innovative tools make producing complex documents easy and cost effective.

Speaking of cost, you can upgrade to WordStar Legacy from your current word processor for a limited time for \$129. Call 1-800-227-5609 now.

And find out why documents created in WordStar Legacy aren't just beyond Word's.

They're beyond words.



Training Tools FOR Laser Users

As personal laser printers become more popular, training new users is increasingly important. *PC Magazine* reviews 17 books and 4 videotapes aimed at novices, experienced laser users, and programmers.

by Bruce Brown

Once the stuff that dreams are made of, the laser printer has become the de facto standard for business printing. And as the price for a personal page printer dips below \$1,000, lasers are landing on more and more desktops. All this is great news, but new users need to be trained. Fortunately, more than a dozen books and videotapes are available to guide the laser initiates in your office.

The original Hewlett-Packard LaserJet, introduced in 1984, combined high-quality output, fast speed, and quiet operation in one package for the first time. Despite its high introductory price of



TRAINING TOOLS

LASER PRINTERS

\$3,495, the LaserJet was a tempting piece of hardware. Since then, laser printers have grown even more attractive and affordable.

Today, the HP LaserJet III, with built-in Resolution Enhancement and PCL Level 5, lists for \$2,395 and is commonly available for under \$1,700. HP's diminutive 4-ppm LaserJet IIP has a list price of \$1,295 (including a seemingly never-ending special that provides a free paper input tray), but it is usually available for just over \$1,000. And HP isn't the only player anymore. A multitude of laser printer vendors have entered the market;

PC Magazine's November 13, 1990, special issue on printers includes page printers from 24 vendors in addition to Hewlett-Packard. Many of these other companies sell printers based on the same Canon laser engines that Hewlett-Packard employs.

POWERFUL AND COMPLEX

Today's lasers are quick and quiet, they print great text and graphics, and they are reasonably priced. So what's the problem? Many people simply don't know

how to use them. The downside to lasers is that they are harder to control than any other kind of printer. With their intelligent circuitry and their own high-memory capacities (often measured in multiple megabytes), laser printers are so powerful that programming them to do what you want is much more complex than with traditional dot matrix or daisy wheel units.

Many people were able to learn simple printer-control codes for dot matrix printers; for example, the \015 printer setup string prints a Lotus 1-2-3 spreadsheet in compressed type. Telling a LaserJet to do the same thing, however, requires a more



EDITORS' CHOICE

• *The LaserJet Handbook, Second Edition*

The first rule you should follow whenever you have a laser-printer-related problem or question is: Read your manual. Hewlett-Packard's LaserJet manuals are well-organized comprehensive guides. But while excellent for novices and fine for super techies, these manuals don't do a great job for those of us in the middle.

Of the 17 books and 4 videotapes reviewed in this article, the hands-down Editors' Choice winner is *The LaserJet Handbook, Second Edition*, by Steven J. Bennett and Peter G. Randall. Honorable mention goes to *LaserJet Unlimited, Edition II*, which is good but less comprehensive. *The LaserJet Handbook* covers everything the average user will ever want to know about printing with the LaserJet. Most of us will never need another LaserJet book. There are sections devoted to setup, extensive troubleshooting, and application tips, as well as a huge section covering PCL commands (the way to go if you want total control over your LaserJet); also included are a useful appendix detailing enhancement options, a glossary, symbol-set and font references, guides to the IID and the IIP, and a guide to the optional utility disk. The latter adds \$15 to the price but has LaserJet macros for dBASE, Lotus 1-2-3, and

WordPerfect, as well as BASIC and DOS batch files. This is an excellent, comprehensive addition to any LaserJet owner's library.

Like all the mainstream printer books on the market at the time of this writing, *The LaserJet Handbook's* shortcoming is that it doesn't cover the LaserJet III, which leaves us with something to look forward to in the third edition. The only general printer book we saw that did cover the III was not published yet. We were very impressed when we sneak-previewed the *LaserJet Companion, Second Edition*, by the Cobb Group, which should be available by the time you read this.

An honorable mention goes to John Woram's *The PC Configuration Handbook*—the place to turn whenever you have a hardware-related problem. Its chapter on printers is quite good, but since this is a general hardware reference book, the treatment is not as detailed as in *The LaserJet Handbook*. Thanks to the thorough, easy-to-read explanations of topics that most of us leave to those mythical creatures in Tech Support Land, this is a golden addition to any PC user's bookshelf.

Of the more specialized books, the best we saw was *The LaserJet Font Book* by Katherine Shelly Pfeiffer, which gets an honorable mention. If you use your LaserJet

for any kind of work with fonts or desktop publishing, get this book. It not only covers all kinds of available LaserJet fonts but also teaches you about font design and how to use certain kinds of software to make scalable fonts. If you own a DeskJet or Apple LaserWriter, you've got limited though respectable choices in reference material: *DeskJet Unlimited* by Steve Cummings and *LaserWriter Reference* by the folks at Apple Computer Corp. Both are fine books. The programmer's books we saw—*Laser Printer Powertools* by Norbert Richter and *HP LaserJet Programming* by Andrew Binstock, David P. Babcock, and Marv Luse—were still in manuscript form, so it's too early to make a clear recommendation.

For ongoing training, you should check periodicals such as the independently-published *LaserJet Journal* (Northbrook, IL). See also Lab Notes and Utilities in the January 29, 1991, issue of *PC Magazine* for an in-depth look at PCL commands and printer macros for your LaserJet. Training seminars are another source that may prove valuable. Because their availability depends on the region you live in, we were not able to review them here. But we recommend you investigate them on your own.

TRAINING TOOLS

LASER PRINTERS

complex command string, ESC(s17H—a long and odd-looking mess of characters that is discouraging to novices.

Setting up, configuring, and maintaining lasers has also become a source of intimidation for the inexperienced user. The inside of a laser looks dauntingly like a photocopier, for which the typical office worker usually employs third-party technical support. In fairness, we should point out that Hewlett-Packard's original LaserJet set a standard for ease of use and maintenance that has not been surpassed to date. Canon's one-piece toner and developer systems allow for clean one-step consumable parts replacement; these and the simple paper-feed trays have done a great deal to minimize support needs. Other smart vendors use similar systems, keeping the consumable parts to a minimum and making parts replacement and paper loading very simple.

Despite the good design of the LaserJet's innards, the programming complexity of laser printers—one of their most powerful attributes—creates a continuing demand for reliable reference materials. This extends to general books on printer operations and software configuration, as well as specialized books that deal with more-advanced topics such as heavy-duty programming and high-end desktop publishing.

SELECTION CRITERIA

In this article, we review 17 books and 4 videotapes, all containing information on how to use laser printers. To gather material for this article, we contacted all major computer book publishers and many other publishing houses, which provided us with their most up-to-date catalogs. To be included here, a book had to be in print and had to cover laser printers. We also included four books not yet published that were made available in various stages of manuscript preparation. In addition to the printer books, we've highlighted some general hardware reference books that do a good job of educating the PC printer user about printers. At the time of this writing, none of the books in print include the LaserJet III, the IIID, or the recently announced IIISi, although one of the previewed books, *LaserJet Companion*, does include the HP LaserJet III family.

Two sources of training not covered here are seminars and periodicals. Because training seminars vary in availability from region to region, we are not able to provide a comprehensive guide to them,

though we do encourage you to investigate them on your own. For ongoing training, one of the best sources is the independently published *LaserJet Journal*, which costs \$49 for a one-year subscription of 6 issues (call 800-323-2686).

The training tools are arranged in order by type, starting with the most-general sources and moving to the most-specific: Hardware Handbooks, Printer Publications, Multivendor Resources, For LaserJets Only, When You Don't Own a LaserJet, Power Printing Guides, Programmers' Codices, and Training Tapes. Sprinkled throughout the article are some useful tips and tricks culled from the training tools and offered by our own experts at *PC Magazine*. For a step-by-step tutorial on PCL programming and macros, see Lab Notes, January 29, 1991.

HELP FROM HP

Before we move on to third-party sources, a look at HP's manuals is worthwhile. In fact, you'd be hard-pressed to find better documentation than what comes with the LaserJets. And HP keeps improving its documentation. The one caveat is that while they're good for novices and very technical users, HP's manuals don't do a great job of guiding the mid-level user. That's why the books covered here are such valuable additions to your library.

As of this writing, every LaserJet is accompanied by a getting started guide, a user manual, and a quick-reference card—each customized for its specific LaserJet model. For the more complicated LaserJets, such as the new LaserJet IIISi (see First Looks, April 16, 1991), HP includes additional materials, such as the network notes that come with the IIISi printer. Software application notes, which contain technical-support phone numbers for the application makers, come with the IIP, III, IIID, and IIISi. We strongly recommend ordering the technical reference manual for your LaserJet (call 800-538-8787). For the LaserJet III and IIID, a card inside the user manual entitles you to a free copy of this document. For other models, the price ranges from \$17 to \$35 per copy.

If you want to get the most from your laser printer, be sure to start with the documentation that came with it. But don't quit there. The training tools covered in this article will take you into new territory only hinted at in HP's manuals.



Hardware Handbooks

- *The PC Configuration Handbook, Second Edition*
by John Woram
- *The Winn Rosch Hardware Bible*
by Winn L. Rosch

You don't have to buy a book dedicated to laser printers to find valuable information for using and understanding them. The best recent general PC-hardware guide is John Woram's *The PC Configuration Handbook, Second Edition* (Bantam Computer Books, \$28.95). This book should be the first place you look whenever you encounter a hardware problem, laser-related or not.

About 60 pages of Woram's 768-page book deal with printers in general; 30 pages concentrate specifically on lasers. Woram stresses printer self-tests and gives command-code sequences you can send to your laser to test various features. There's an informative section on printer diagnostics where you can find out what all those cryptic cries for help from your printer really mean. He also covers printer setup and configuration (both hardware and software), print quality, paper problems, and toner-cartridge difficulties. Photographs are few, but there are many clear illustrations to help you make sense of what you are reading.

Another useful hardware reference book is the one penned by *PC Magazine*'s own contributing editor Winn L. Rosch. *The Winn Rosch Hardware Bible* (Brady Computer Books, \$29.95) is a comprehensive 628-page volume that may seem to rival Woram's book but actually covers

TRAINING TIPS

A Different Kind of Escape

"Since printer commands use the same 128-character ASCII set used for conventional printing, each command sequence begins with the so-called 'escape code' (ASCII 27), which signals the printer that the character(s) immediately following are command codes, not characters to be printed. And, like all good computer code, printer commands are about the next best thing to incomprehensible to the human reader."

—*The PC Configuration Handbook*, Second Edition, by John Woram, page 586



slightly different ground.

Where the *Hardware Bible* is conceptual and definitional, *The PC Configuration Handbook* offers more hands-on fix-it advice. If you want to know in depth what something is or how it works, look in the *Hardware Bible*; if you want to know how to make it work for you, look in *The PC Configuration Handbook*. Both books are valuable additions to any PC library.

The Winn Rosch Hardware Bible contains a 28-page chapter dealing with all types of printers. The chapter is not organized by printer type but by printer function or characteristic. To discover everything the book has to say about lasers, read the whole chapter. There is little on actually setting up or using a printer, but all the relevant technology is clearly defined, as are features and capabilities. Reading this will make buying the right printer easier.

***The PC Configuration Handbook*, Second Edition**
by John Woram

Bantam Computer Books, 666 Fifth Ave., New York, NY 10103; 800-223-6834 ext. 9479, 212-492-9479 (in New York).

List Price: \$28.95. **Pages:** 768 pp. **Copyright:** 1990. **ISBN:** 0-553-34947-3.

In Short: If you've got a hardware problem, *The PC Configuration Handbook* is the book you need. John Woram has written a truly excellent PC how-to manual, including a comprehensive chapter on printers.

CIRCLE 623 ON READER SERVICE CARD

The Winn Rosch Hardware Bible

by Winn L. Rosch
Brady Computer Books, Simon & Schuster Software, 15 Columbus Circle, New York, NY 10023; 800-223-2348.

List Price: \$29.95. **Pages:** 628 pp.

Copyright: 1989. **ISBN:** 0-13-160979-3.

In Short: This is an excellent and comprehensive hardware manual written by *PC Magazine* contributing editor Winn L. Rosch. It focuses on defining hardware terms and concepts. The chapter on printers is an excellent reference tool for PC printer owners.

CIRCLE 624 ON READER SERVICE CARD



Printer Publications

■ ***The Printer Bible***
by Scott Foerster

■ ***Tips & Tricks for Your PC Printer***
by Ralf Ockenfelds

Two currently available books cover all types of PC printers: *The Printer Bible* by Scott Foerster (Que, \$29.95) and *Tips & Tricks for Your PC Printer* by Ralf Ockenfelds (Abacus, \$34.95 with companion disk). For laser users, only Foerster's is helpful because Ockenfelds's tome doesn't mention laser printers at all, except in passing.

The Printer Bible is a dense 688-page book with a few illustrations and screen shots, but it has no photographs. The four general divisions cover basic printer information, printer setup and management, desktop publishing, and maintenance and

troubleshooting. Because it is organized by function rather than by printer type, it avoids repeating general information for different makes and models. If you want to read everything about laser printers, you will need to work your way through the book carefully. For example, if you want to find out how to use printer commands for your laser printer, you'll have to look in separate sections for job control commands, page control commands, font manipulation, font selection, font management commands, and graphics commands. Particularly useful to laser owners are the sections on laser engines, PostScript printers, and purchasing.

In addition to a 12-page glossary, there are appendices with reference material on printer command languages, printer vendors, font vendors, and the symbol names of over 1,500 printable characters. Helpful hints are scattered throughout the book, again organized by functional areas.

Ockenfelds's *Tips & Tricks for Your PC Printer* is essentially useless for laser owners. Oddly enough, even though it was published in 1990, Ockenfeld doesn't even mention laser printers—except in the glossary. The 389-page book covers printer installation and use, graphics, software commands, and how to send text files; it also contains a troubleshooting section targeted at dot matrix owners. While the book may be helpful if you use a dot matrix product, the material covering printers in general can be found in books dealing specifically with laser printers, and is covered better in Foerster's *The Printer Bible*.

The Printer Bible

by Scott Foerster

Que, 11711 N. College Ave., Carmel, IN 46032; 800-428-5331.

List Price: \$29.95. **Pages:** 688 pp. **Copyright:** 1990. **ISBN:** 0-88022-512-2.

In Short: If you have more than one printer in your life, *The Printer Bible* will prove invaluable. Because the book is organized by printer function rather than by printer type, you will have to read a lot of it to garner all the laser information.

CIRCLE 625 ON READER SERVICE CARD

Tips & Tricks for Your PC Printer

by Ralf Ockenfelds

Abacus, 5370 52nd St. SE, Grand Rapids, MI 49512; 800-451-4319, 616-698-0330.

List Price: \$34.95 (with companion disk). **Pages:** 389 pp. **Copyright:** 1990. **ISBN:** 1-55755-075-1.

In Short: A modern oddity, *Tips & Tricks*

WORKING WORLD

WEEKLY

95¢

Get Your Copy Today

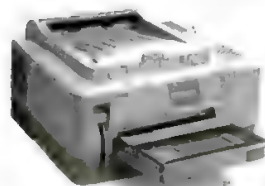
Vol. 1, Issue 7

THOUSANDS SEE POWERFUL BEAM OF LIGHT ON HORIZON

**Startling event
heralds new age
of productivity**



**Mysterious voice
says: "We will be
your leader!"**



It's here. It's new. It's the Konica LP-3110 Laser Printer. High speed. High quality. Ultimate compatibility. Prints at ten pages per minute with 300x300 dpi. Plus 24 resident fonts, resident and expandable memory cards, all at a remarkably affordable price. Is it friendly? Don't be afraid. It's a Konica.

For more information, call today.
(1-800-456-6422) ext. 15.

1-800-4-KONICA

CIRCLE 279 ON READER SERVICE CARD



Konica
COPIERS • FAX
LASER PRINTERS

TRAINING TOOLS

LASER PRINTERS

for Your PC Printer does not deliver on the implied promise of an all-purpose printer guide. It leaves out today's most important category of PC printers: lasers. If you need laser help, look elsewhere.

CIRCLE 626 ON READER SERVICE CARD



Multivendor Resources

- *The Laser Printer Handbook* by David Myers

TRAINING TIPS

Toner Cartridge Concerns

"Most laser printers have a print density dial. If the difference between bold and regular printing is hard to see, try changing the position of the knob. You could be wasting toner as well as producing ugly documents."

—*The Printer Bible*, by Scott Foerster, page 218



David Myers's *The Laser Printer Handbook* (Business One Irwin, \$24.95) is currently the only book available that is devoted entirely to laser printers and covers more than one brand—in this case, both Hewlett-Packard and Kyocera. Specific information is included about the HP LaserJet Series II and Kyocera F-1000A printers.

Most of the material you will find in *The Laser Printer Handbook* discusses how to use laser printers with word processing software, specifically with *Microsoft Word*, *MultiMate*, and *WordStar*. There's also a whole chapter that is specifically devoted to *Lotus 1-2-3* printing techniques.

If you use a Kyocera printer, this 289-page book is a must-buy; it's the only one on the market that deals specifically with Kyoceras. Myers's book is also a good reference for HP LaserJet Series II users, especially if they want to get the most help in printing from one of the three word-processing programs covered. Unless you use Kyocera or HP LaserJet Series II printers, however, the book has limited utility.

The Laser Printer Handbook

by David Myers

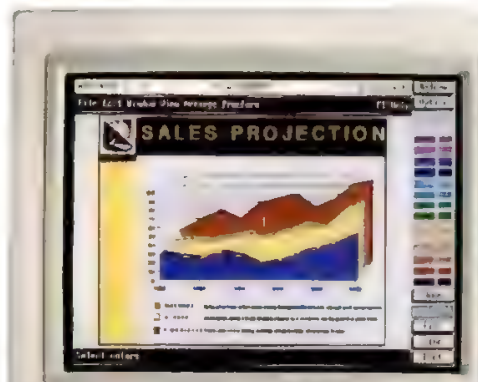
Business One Irwin, 1818 Ridge Rd., Homewood, IL 60430; 708-206-2790.

List Price: \$24.95. **Pages:** 289 pp. **Copyright:** 1989. **ISBN:** 1-55623-133-4.

In Short: Primarily for using HP and Kyocera printers with various word-processing programs, *The Laser Printer Handbook* mentions some spreadsheet tips,

Eeeek!

New APPLAUSE II™ version 1.5 is the easiest way to create spectacular business graphics. And the free Microsoft Mouse inside each box (a \$125 value) makes it even easier and faster. Because



APPLAUSE II

© 1989 Ashton-Tate

~DOS



the APPLAUSE II "windows-like" interface was designed for the mouse.

TRAINING TOOLS LASER PRINTERS

too. It's a must for Kyocera users and a solid investment for LaserJet II owners, but there are better books for owners of other lasers.

CIRCLE 627 ON READER SERVICE CARD



For LaserJets Only

- *The Hewlett-Packard LaserJet Printer Handbook* by Alfred E. Poor II

- *LaserJet Companion*, Second Edition by the Cobb Group (Mark W. Crane, Joseph R. Pierce, and David Holzgang)

- *The LaserJet Handbook*, Second Edition by Steven J. Bennett and Peter G. Randall

- *LaserJet IIP Essentials* by Steve Cummings, Mike Handa, and Jerold Whitmore

- *LaserJet Unlimited*, Edition II by Ted Nace and Michael Gardner

The huge Hewlett-Packard LaserJet customer base has inspired a wealth of books specifically about HP LaserJets. If you still have a LaserJet Series II—or an even earlier model—*The Hewlett-Packard LaserJet Printer Handbook*, by PC Magazine contributing editor Alfred Poor, is an excellent resource. If you need something more up-to-date, both *The LaserJet Handbook*, Second Edition, and *LaserJet Un-*

TRAINING TIPS



Envelopes, Labels, and Transparencies

"It's better to let the envelope tray run empty and reload it than to insert several envelopes at a time. By loading a few envelopes at a time, you are more likely to introduce air pockets between the envelopes, which can result in jamming."

—*The LaserJet Handbook*, Second Edition, by Steven J. Bennett and Peter G. Randall, page 92

"If you are going to print labels on a LaserJet, get the Avery LaserPro software. It makes it so easy, even merging data from Lotus 1-2-3 or dBASE."

—Alfred Poor, contributing editor, PC Magazine

There's A Mouse In The Box.

Which means you can do bar, pie, line or word charts—or draw—simply by pointing and clicking. Create 35mm slides, overheads, hard copy or on-screen presentations. In black and white or in your choice of 3.6 million colors.

InfoWorld says APPLAUSE II is "easier to work with than either Harvard Graphics or Freelance Plus, and faster than the Windows-based prod-

ucts." And *PC Magazine* says APPLAUSE II has "a fluidity and ease-of-use not found in either Harvard Graphics or Freelance Plus."

Version 1.5 adds an 80,000-word spelling

checker, full LAN capability, 700 pieces of clip art, and much more. Including an all-new RunTime that lets you show screenshows to colleagues who don't have APPLAUSE II.

Call 1-800-437-4329 ext. 1311 now for a free demo disk* and the name of your nearest dealer. Current users can call 1-800-2ASHTON to upgrade to APPLAUSE II version 1.5 for just \$50.**

But mouse supplies are limited, so act now. If you miss out on this very special opportunity, it's going to gnaw at you.

 Ashton-Tate®

limited, Edition II, cover the LaserJet family up to the IIP. If you're a IIP user only, there's a book just for you: *LaserJet IIP Essentials*. As of this writing, no mainstream books cover the HP LaserJet III and IIID, let alone the new IIISi. But that dearth in the marketplace will be filled soon: We looked at a few chapters from the forthcoming *LaserJet Companion*, Second Edition, which covers the IIIs.

Published in 1989 (and unrevised to date), Alfred E. Poor's *The Hewlett Packard LaserJet Printer Handbook* (Business One Irwin, \$24.95) is too old to include material on the LaserJet IIID, IIP, or III. Nevertheless, the 247-page work is a valuable concise reference guide for owners of the LaserJet Series II, the LaserJet Plus, and even the LaserJet.

It covers printer setup and configuration and even has a small section explaining how these machines work. After setup, Poor moves on to printer control, touching on everything from PCL and BASIC commands to print orientation, pitch, and even special features like envelope printing, forms printing, and macros. There's a section on using these older printers with your favorite applications, notably *dBASE III*, *Lotus 1-2-3*, *Microsoft Word*, *WordPerfect*, and a few more. The work closes with an interesting section on add-on products (both hardware and software), followed by appendices covering escape commands and default settings, the ASCII table, and a one-page explanation of IBM-compatible serial cables. If you have one of the newer LaserJets, look elsewhere for guidance, but if you're still using an older model or just inherited one (without the manuals, undoubtedly), this book can save you hours of old-technology heartache.

For up-to-date information through the LaserJet IIP (introduced in 1989), the best book is *The LaserJet Handbook*, Second Edition, by Steven J. Bennett and Peter G. Randall (Brady Computer Books). The standard 518-page version costs \$24.95; another version, which runs to 560 pages and includes a 360K 5.25-inch utility disk, costs \$39.95. The disk contains BASIC and DOS batch files, as well as *dBASE* programs and *Lotus 1-2-3* and *WordPerfect* LaserJet macros.

Bennett and Randall cover setup, operation, maintenance, and troubleshooting of HP laser printers through models IIID and IIP. There are also sections on using LaserJets with *Lotus 1-2-3*, *Microsoft Word*, and *WordPerfect*. Almost half the book is devoted to reference informa-

tion on PCL control codes. The last section has several appendices, which include descriptions of various LaserJet Series II hardware and software enhancement options, a glossary, font and symbol-set references, guides to the IIID and IIP models, and information on using the disk's utility software. *The LaserJet Handbook* is a solid reference work with especially good information on PCL codes, and it's laid out in a clear format with examples that are easy to try.

The second-best book, equally up-to-date, is *LaserJet Unlimited*, Edition II, by Ted Nace and Michael Gardner (Peachpit Press, \$24.95). A significant portion of this 512-page work covers using HP LaserJets with third-party software, including setup utilities, word processors, text-and-graphics merge programs, graphics and desktop publishing programs, spreadsheets, databases, form software, tax software, and font generators, editors, and enhancers. *LaserJet Unlimited* has competent sections on printer setup and opera-

tions as well as troubleshooting and problem solving, but the book's major strength is its unsurpassed explanations on using third-party software with LaserJets.

Two years ago, when HP brought out the LaserJet IIP—with its \$1,000 street price—it was the first affordable laser. Today many users can't afford more than the IIP and find they really don't need more than its 4-page-per-minute speed. For these IIP-only users, there's *LaserJet IIP Essentials* by Steve Cummings, Mike Handa, and Jerold Whitmore (Peachpit Press, \$21.95). An indispensable guide for IIP owners, it covers all the basics and has extensive information on using the printer with major applications programs.

LaserJet IIP Essentials contains profiles on using the IIP with selected desktop publishing programs, *PageMaker* and *Ventura Publisher*. *Artline*, *Arts & Letters Graphics Editor*, *CorelDRAW!*, *Draw Plus*, *Micrografx Designer*, and *PC Paintbrush* are also covered under a chapter concerning the IIP's use with paint and high-end drawing packages. A business-software section handles the IIP's abilities under *dBASE*; *dbPublisher*; *Excel*; *Lotus 1-2-3*, Release 2.2; *Microsoft Quattro Pro*; *Paradox*; and *Wingz*. A small section covers charting programs and font software. Printer utilities are mentioned as well, with plenty of specific source names and addresses.

LaserJet IIP Essentials uses graphical elements frequently, for design aesthetics and to help you identify cautions (a turtle), notes (an eyeball), and tips (a pointing hand). This excellent book seems designed to get the bewildered executive's laser up and running as quickly as possible.

By the time you read this article, a book that includes material on the LaserJet IIIs will be available: *LaserJet Companion*, Second Edition, by the Cobb Group—Mark W. Crane, Joseph R. Pierce, and David Holzgang (Microsoft Press, \$27.95). The new book will include information on earlier LaserJets, too. We saw only five chapters in manuscript form; they were on LaserJet fonts, maintenance and troubleshooting, utilities and enhancements, PCL commands, and using the LaserJet with *Microsoft Windows 3.0*. The Cobb Group has an excellent reputation, and the chapters we read are impressive in their comprehensiveness. The section on *Windows 3.0* is of particular interest.

The Hewlett Packard LaserJet Printer Handbook
by Alfred E. Poor II

TRAINING TIPS

Toner Cartridge Concerns



"If you bring a cold cartridge into a warm room and install it without letting it reach room temperature, condensation will immediately form on the toner and drum when you pull the tape. This will result in lumpy toner and poor print quality. To avoid this problem, if you store your toner cartridges in a separate room that is kept at a lower temperature, allow them to adjust to the temperature of the work area before installation."

—*The LaserJet Handbook*, Second Edition, by Steven J. Bennett and Peter G. Randall, page 115

"You can extend the life of your toner a bit when it goes light around the edges. Just remove the cartridge and rock it side to side to redistribute the toner."

—Bill Howard, executive editor, *PC Magazine*

No other fax/modem can send like this:

by Helen Lindberg

from David M. Taylor

2-6-91 7:11pm p. 2 of 2



One step, ten seconds--that's what it took for someone to send this fax using Intel's new SatisFAXtion™ fax/modem.

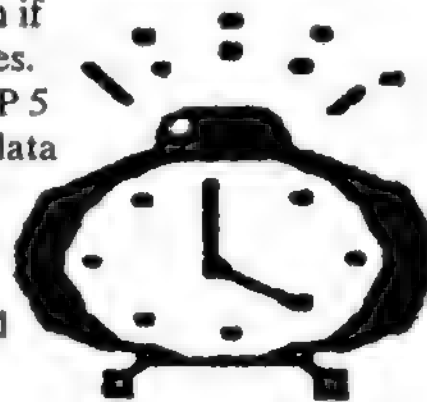
And with other fax/modems? Forget about "one step". Instead, you'll likely encounter all sorts of long, tedious procedures. Worse yet, once a fax starts to go out (or come in), some bring your work on the PC to a screeching halt. Even a one-page fax could tie you up for minutes.

But the SatisFAXtion board lets you fax a document exactly as you'd send it to your own printer. You don't need to leave your application, or mess with a lot of keyboard hocus-pocus.

And because it has a built-in 16MHz, 80186 microprocessor, the SatisFAXtion fax/modem sends and receives completely in the background. You can continue with whatever work you're doing--even if you're sending out a hundred faxes.

There's even a powerful MNP 5 data modem, for fast, error-free data communications.

Now that you know how well the SatisFAXtion board sends, look to the right to learn how well it's been received.



There's plenty more we'd love to tell you about Intel's new SatisFAXtion board: Windows 3.0 compatibility, low memory use, output quality, scanner support, telephone support, and its five-year warranty, for starters. For details, just call (800) 525-3019 and ask us to fax you document #9895. Or call Intel customer service at (800) 538-3373.

intel®

The Computer Inside™

TRAINING TOOLS LASER PRINTERS

Business One Irwin, 1818 Ridge Rd., Homewood, IL 60430; 708-206-2790.

List Price: \$24.95. **Pages:** 247 pp. **Copyright:** 1989. **ISBN:** 1-55623-156-3.

In Short: Although dated, contributing editor Alfred E. Poor's *Hewlett Packard LaserJet Printer Handbook* does an excellent job covering everything from the original LaserJet to the LaserJet Series II.

CIRCLE 628 ON READER SERVICE CARD

LaserJet Companion, Second Edition by The Cobb Group (Mark W. Crane, Joseph R. Pierce, and David Holzgang) Microsoft Press, One Microsoft Way, Redmond, WA 98052-6399; 800-677-7377.

List Price: \$27.95. **Pages:** 600 pp. **Copyright:** 1991. **ISBN:** 1-55615-356-2.

In Short: Available to us only in partial manuscript form, *LaserJet Companion* promises to be an excellent addition to your LaserJet library—and one of the first books to include information on the LaserJet IIIs.

CIRCLE 629 ON READER SERVICE CARD

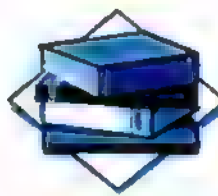


The LaserJet Handbook, Second Edition

by Steven J. Bennett and Peter G. Randall

TRAINING TIPS

Paper Problems



"Paper quality matters. For really important stuff, specify Hammermill Laser Print Sheet. It's 24 pounds, and it feels wonderful in your hand. Silky smooth."

—Bill Howard, executive editor, *PC Magazine*

Brady Computer Books, Simon & Schuster Software, 15 Columbus Circle, New York, NY 10023; 800-223-2348.

List Price: \$24.95; with utility disk, \$39.95. **Pages:** 518 pp. (without utility disk), 560 pp. (with utility disk). **Copyright:** 1990. **ISBN:** 0-13-523580-4 (without utility disk), 0-13-523754-8 (with utility disk).

In Short: *The LaserJet Handbook* is the best book on the market. An excellent complement to your LaserJet manuals, it

covers the early models up through the LaserJet IIP. If you think you will use the utilities, buy the version with the disk.

CIRCLE 630 ON READER SERVICE CARD

LaserJet IIP Essentials

by Steve Cummings, Mike Handa, and Jerold Whitmore

Peachpit Press, 1085 Keith Ave., Berkeley, CA 94708; 800-283-9444, 415-527-8555.

List Price: \$21.95. **Pages:** 376 pp. **Copyright:** 1990. **ISBN:** 0-938151-18-5.

In Short: *LaserJet IIP Essentials* is a complete guide to the IIP. If you own one, get this book; it covers everything!

CIRCLE 631 ON READER SERVICE CARD

LaserJet Unlimited, Edition II

by Ted Nace and Michael Gardner

Peachpit Press, 1085 Keith Ave., Berkeley, CA 94708; 800-283-9444, 415-527-8555.

List Price: \$24.95. **Pages:** 512 pp. **Copyright:** 1988. **ISBN:** 0-938151-02-9.

In Short: *LaserJet Unlimited* is the second-best book available. It covers the early models through the IIP and is especially strong when it comes to third-party software specifics.

CIRCLE 632 ON READER SERVICE CARD

Give Us Your Toughest Peripheral Sharing Problem

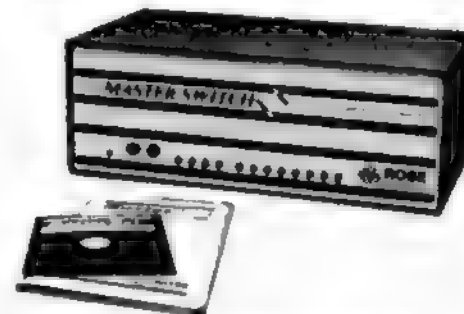
...or your simplest! Master Switch, the intelligent data switch from Rose Electronics, can handle it. The Master Switch series is so versatile and sophisticated, peripheral sharing becomes easy.

Anyone who appreciates ease-of-operation and technologically-advanced capabilities knows the Master Switch is the right choice...for sharing printers, plotters, modems, and any device with a serial or parallel port. Here's why:

- Any combination of serial or parallel ports
- Easy selection of peripherals
- User-expandable memory up to 4 megabytes
- Simultaneous access to all devices
- Rated 'fastest switch' by PC Magazine
- Advanced features include job queue, port contention, data collection, job control menu, initialization strings, pop-up menus, and many more
- Complete technical support; one-year warranty

The Low-Cost LAN Alternative
With our MasterNet software, the Master Switch provides many convenient LAN functions, such as E-mail, file transfer, and directory access.

Designed and manufactured in the USA. Field-proven in thousands of applications. The Master Switch answers any peripheral sharing challenge. Choose the intelligent data switch that handles your most complex needs, yet is easy to set up and operate... choose Master Switch.



ROSE ELECTRONICS

(800) 333-9343

FAX (713) 933-0044 • (713) 933-7673
P.O. Box 742571 • Houston, Texas 77274
Call for complete information and our catalog of Switching and Sharing Solutions. Dealer inquiries welcome.

CIRCLE 290 ON READER SERVICE CARD

No other fax/modem can receive like this:

"1990 Award of Excellence...this add-in board
is terrific."

—*Byte magazine*

"Very nice...quick and memory conscious."

—*SatisFAXtion owner*

"Most Valuable New Product of 1990...the board
that finally makes PC faxing as easy and inexpensive
as using a standalone fax machine."

—*PC/Computing magazine*

"Best fax/modem I've used and installed."

—*SatisFAXtion owner*

"Product of the Year for fax boards and fax servers."

—*Systems Integration magazine*

"Excellent product!" "Excellent value!!!"

—*SatisFAXtion owners*

From day one, Intel's new SatisFAXtion fax/modem has received unbridled enthusiasm from PC users and industry experts alike. But there's one more person we'd love to impress—you. To learn a little about SatisFAXtion, just look to the left. To learn a lot, call (800) 525-3019 and ask us to fax you document #9895. Or call Intel customer service at (800) 538-3373.

intel®

The Computer Inside.™

CIRCLE 374 ON READER SERVICE CARD

©1991 Intel Corporation. SatisFAXtion is a trademark of Intel Corporation.

TRAINING TOOLS

LASER PRINTERS



When You Don't Own A LaserJet

- *DeskJet Unlimited*
by Steve Cummings
- *LaserWriter Reference*
by Apple Computer Corp.

Not every laser user has an HP LaserJet. Popular alternatives include HP's own DeskJet, which is a less expensive ink jet alternative to the LaserJet, and Apple's LaserWriter, the first PC PostScript laser printer. Fortunately, there's a third-party reference work currently available for each product.

DeskJet Unlimited by Steve Cummings (Peachpit Press, \$21.95) is a 428-page book covering both the HP DeskJet and the DeskJet Plus—but not the DeskJet 500, which won *PC Magazine* Editors' Choice in our November 13, 1990, special issue on printers. Cummings, who also coauthored *LaserJet IIP Essentials* (mentioned above), has a very readable personal style. This and his thorough coverage of the topic make *DeskJet Unlimited* a must-buy for DeskJet owners.

DeskJet Unlimited is loaded with information, tips, hints, and cautions to help you get the most from your inkjet printer. More than a third of the book is dedicated to using DeskJets with specific application programs, including many popular paint-and-draw, word processing, forms, spreadsheet, desktop publishing, and even charting programs; there is also a chapter on using the DeskJet with *Microsoft Win-*

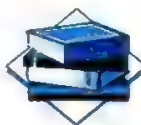
dows 3.0. A significant portion covers programming the DeskJet with PCL codes. In addition, Cummings introduces specific instructions and recommendations for many printer, screen-shot, and font utilities. There are also instructions for turning your DeskJet into a PostScript machine, and even ways to hook it up to a Macintosh.

Addison-Wesley Publishing Co. is the publisher of several books authored by Apple Computer Corp. *LaserWriter Reference* (\$19.95) is a 184-page hardcover work that covers operations, capabilities, and ways to communicate with various LaserWriter printers, including the original LaserWriter and the Plus, IINT, and IINTX models.

LaserWriter Reference makes for fairly dry reading and is aimed at a rather sophisticated audience, but it may be valuable as a reference book. It includes information about various features of the different LaserWriter printers and how to communicate with them in different software envi-

TRAINING TIPS

Paper Problems



"Laser printers will print on the cheapest copy machine paper available. But, when the humidity is high, pieces of paper stick together. To prevent this, paper manufacturers put powder between the sheets. The heavier the paper (and therefore more expensive), the more dust accumulates. The more dust there is, the more uneven the paper surface becomes, because the dust tends to stick and create ridges. The more uneven the paper, the poorer the image. Cheap paper costs between \$2 and \$4 per bundle of 500 sheets. A bundle of 500 sheets is called a ream. Ideally, the ream is packaged in poly laminated moisture-proof wrap. A ream of special laser paper, Hammermill laser stock, is discounted to about \$5 a ream."

—*The Printer Bible*, by Scott Foerster, page 215

TRAINING TIPS

Envelopes, Labels, and Transparencies



"Avery is a good source of information about how to print mailing labels using your PC. When you buy a package of Avery laser printer labels, you get a small booklet with tips on printing labels from popular PC and Macintosh programs, including 1-2-3, Microsoft Word, WordPerfect, and dBase. For help over the telephone with label printing, call Avery's support line at 818/792-8489."

—*DeskJet Unlimited* by Steve Cummings, page 282

ronments. There is extensive information on working with fonts and using LaserWriter Diablo 630 and Hewlett-Packard LaserJet Plus emulators. The guide also covers the PostScript language and its commands as used with LaserWriters. This "from the source" manual is a worthy reference addition to your library if you're a technically minded LaserWriter user; however, if you'd like clear, basic information on laser printers in general, look elsewhere.

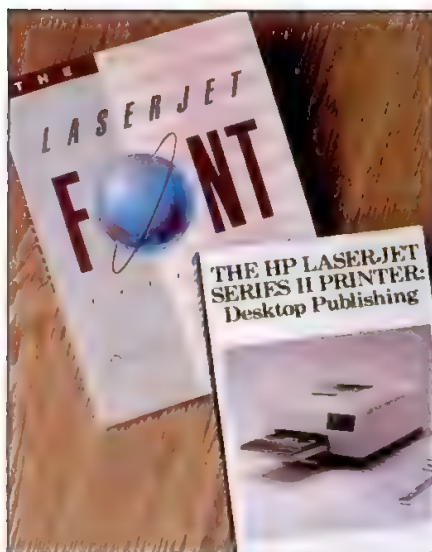
DeskJet Unlimited
by Steve Cummings
Peachpit Press, 1085 Keith Ave., Berkeley, CA 94708; 800-283-9444, 415-527-8555.
List Price: \$21.95. **Pages:** 428 pp. **Copyright:** 1990. **ISBN:** 0-938151-11-8.

In Short: *DeskJet Unlimited* is another excellent work from Steven Cummings. These pages contain information on all aspects of owning a DeskJet, from what to do when you take it out of the box to how to print custom fonts.

LaserWriter Reference
by Apple Computer Inc.
Addison-Wesley Publishing Co. Inc., Rte. 128, Reading, MA 01867; 617-944-3700.
List Price: \$19.95. **Pages:** 184 pp. **Copyright:** 1988. **ISBN:** 0-201-19258-6.

In Short: *LaserWriter Reference* is a dry dictionary-like reference manual for those using a LaserWriter. You'd better know what you are doing, though; this book is not aimed at beginners.

CIRCLE 633 ON READER SERVICE CARD



Power Printing Guides

- *The HP LaserJet Series II Printer: Desktop Publishing* by Nathan Goldenthal
- *The LaserJet Font Book* by Katherine Shelly Pfeiffer

TRAINING TOOLS LASER PRINTERS

- *Laser Printer Powertools* by Norbert Richter

Laser printers helped ignite the desktop publishing revolution. Three books on the market today will help you use your laser for desktop publishing.

Despite the moniker, *The HP LaserJet Series II Printer: Desktop Publishing*, by Nathan Goldenthal (Weber Systems, \$24.95) doesn't dive deeply into desktop publishing and typesetting concepts with the LaserJet Series II, as it claims. Only a small part of the 374-page book's beginning—roughly 50 pages—deals with cover publishing and typesetting concepts, and then only generally. Most of the space is devoted to documenting PCL commands and font designs. If you are already a sophisticated desktop publisher and just want to learn more about the LaserJet II, this book may be for you.

If you routinely use lots of different fonts or need a reference for fonts used with laser printers, nothing beats *The LaserJet Font Book* by Katherine Shelly

TRAINING TIPS

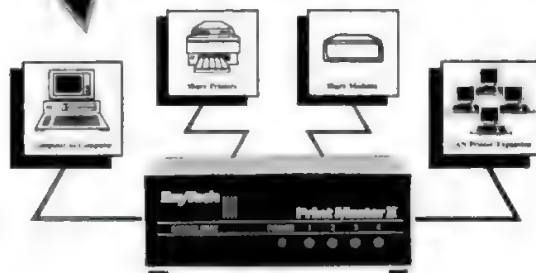


All About Fonts

"Just copying a soft font to the directory where your application software resides won't enable you to access the fonts. Nor can you just copy a soft font directly to your printer using the DOS COPY command without first alerting the printer via the proper PCL command. Your application software must be able to recognize the presence of the soft font and provide a means for downloading and using it with your data. If the software doesn't provide a means for automatically downloading the soft font from your computer disk to your printer, you must manually download the font or use a utility program."

—*The LaserJet Handbook*, Second Edition, by Steven J. Bennett and Peter G. Randall, page 134

804 Series AFFORDABLE CONNECTIVITY



A VERSATILE LAN-ALTERNATIVE FOR \$395



THREE MODELS TO MEET YOUR APPLICATIONS

The Print Master® II 804 Series is BayTech's newest intelligent controller with four ports and a 256KB dynamically allocated buffer. Available in your choice of four serial ports (RS-232C or RS-422A), four parallel ports, or two serial and two parallel ports, the 804 Series offers affordable connectivity.

The 804 Series provides a cost-effective solution for users who want to maximize their resources. Each four port model allows you

to connect any combination of computers, printers, and plotters for:

- printer sharing
- plotter sharing
- buffering of data
- LAN printer expansion

Models with serial ports allow you to also connect modems or any other RS-232C device for computer-to-computer communication and modem sharing.

The 804 Series allows simultaneous data input from computers, output of print data and full duplex communication between pairs of computers.

LAN APPLICATIONS

The 804 Series is ideally suited for expanding the printing capabilities of a LAN system. By acting

as a printer server, it can off-load network traffic and provide port expansion and error buffering.

BayTech products are covered by a one-year warranty and are supported toll-free by a team of application engineers.

Call us today to learn how the new Print Master® II 804 Series can become your connectivity solution.

BayTech

Bay Technical Associates, Inc.
Data Communications Products Division
200 N. Second St., P.O. Box 307
Ber St. Louis, MO 63102 USA
FAX: 601-467-4151
Phone: 601-467-6271 or toll-free
800-823-2702

Is this how your communications software deals with line noise?

WARNING:
File Transfer
Aborted.

We have a better way.

Take one last look at this screen shot. With BLAST,® you'll never see it again. BLAST is the software that was designed to shrug off line noise—and we've been doing it better than anyone else for the last 12 years. Along the way, we added data compression, and the incredible ability to restart from the point of interruption making BLAST the world's fastest protocol.

Introducing new BLAST with TrueTerm™ emulation.

You've always been able to depend on BLAST to get your data through. Now we've added the honest terminal emulation you deserve. Honest terminal emulation is exactly what you get with BLAST's exclusive TrueTerm emulation feature. That means precise emulation. Included are terminals like WYSE 60/50, VT 320/220, PC ANSI Color, Data General 461, and more than a dozen others.

When you move up to BLAST with TrueTerm there are no compromises. Your terminal emulation looks, feels and works the way it should, every time. Call us today for more details.

BLAST
A U.S. Robotics Company

1-800-24 BLAST
or 1-504-923-0888

CIRCLE 371 ON READER SERVICE CARD

CIRCLE 200 ON READER SERVICE CARD

TRAINING TOOLS

LASER PRINTERS

TRAINING TIPS

All About Fonts



"Buy your first faces in at least a four-member family, with a regular (or medium) face, italic, bold, and bold italic. Some typefaces, such as Goudy Old Style, include extra bold instead of italic and this is acceptable. If you can afford it, buy one set of serif and one set of sans serif faces. Display faces for headlines and special occasions can come later. Italic, bold, and bold italic faces will serve admirably for display faces until you can afford more."

—*The LaserJet Font Book* by Katherine Shelly Pfeiffer, pages 1–3

tions existing fonts, including company and brand names, and drawing programs used to produce scalable fonts. Pfeiffer covers all existing type styles available for HP laser printers. This book is a gem even for the experienced desktop publisher.

Just before we went to press, we caught a sneak preview of *Laser Printer Power-tools* by Norbert Richter (Abacus, \$34.95 with utility disk), which should be available by the time this issue hits the stands. Although it's very hard to evaluate this book on the sketchy materials provided—the preface, the table of contents, and the first chapter—nothing we saw indicates that it will be especially attractive to power users. A utility disk for the book is planned but was not supplied for review.

The HP Laserjet Series II Printer:

Desktop Publishing

by Nathan Goldenthal
Weber Systems Inc., 8437 Mayfield Rd.,
Chesterland, OH 44026; 216-729-2858.

List Price: \$24.95. **Pages:** 374 pp. **Copyright:** 1987. **ISBN:** 0-938862-62-6.

In Short: Don't buy *The HP Laserjet Series II Printer: Desktop Publishing* if you want to

learn how to publish from your desktop. Only about 50 pages cover such material, while the rest of this book is devoted mainly to PCL commands and font designs.

CIRCLE 835 ON READER SERVICE CARD

The LaserJet Font Book

by Katherine Shelly Pfeiffer
Peachpit Press, 1085 Keith Ave., Berkeley,
CA 94708; 800-283-9444, 415-527-8555.

List Price: \$24.95. **Pages:** 332 pp. **Copyright:** 1990. **ISBN:** 0-938151-06-1.

In Short: A desktop publishing treasure, *The LaserJet Font Book* will teach you just about everything there is to know about font designs on a LaserJet. And it has the advantage of covering the LaserJet III.

CIRCLE 836 ON READER SERVICE CARD

Laser Printer Power-tools

by Norbert Richter
Abacus, 5370 52nd St. SE, Grand Rapids,
MI 49512; 800-451-4319, 616-698-0330.

List Price: \$34.95 (with utility disk). **Pages:** Information unavailable. **Copyright:** 1991. **ISBN:** 1-55755-095-6.

In Short: We saw only a tiny portion of *Laser Printer Power-tools*, but we are not convinced that the book is actually targeted for the power user.

CIRCLE 837 ON READER SERVICE CARD

3X-LINK 16 MORE THAN PRINTER SHARING

When you need :

- To Share multiple Printers with up to 16 PC's, Laptops, and PS/2s.
- To Transfer Files, and send E-Mail in background mode at 500,000 bps.
- To find the Most Flexible Topology for easy wiring.
- To choose a Low Cost, Easy to Use product.

Link 16 is the solution providing : Powerful Software. The spooler allows you to control your print queue. You can also use autoscripts to automatically transfer files and E-Mail in the background. Link 16 even has multi-level passwords for added security.

Easy Installation. Link 16 plugs right in between your parallel port and your printer cable. There's no need for an expansion slot. Link 16's daisy chain topology allows you to connect up to 400'.

Low Price and no Risk. With our 30 Day Money Back Guarantee you can try link 16 without risk. And at \$139 per workstation, there is no better value in connectivity !

To order, call us today at 800-327-9712.



HIGH FLYING COMMUNICATIONS

3X USA Corp. One Executive Drive Fort Lee N.J. 07024
Phone : (800) 327-9712 - (201) 592-6874 - Fax : (201) 592-0908

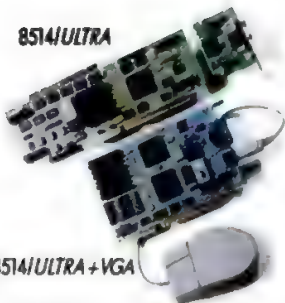


CIRCLE 234 ON READER SERVICE CARD

A list of all the things you can do waiting for ATI's new 8514/ULTRA to open Windows.



8514/ULTRA



Don't blink now! Keep both eyes open or you may miss the revolutionary new way of looking at Windows.*

For openers, nothing matches the 8514/ULTRA† for speed. Other cards claim they're fastest, but don't let them pull the wool over your eyes.

The 8514/ULTRA runs Windows 24 times faster than Super-VGA cards*. And five times faster than TI 34010* cards*. It has the power to deliver 386 graphics performance on a 286 machine, and then some. So you don't have to spend big bucks to upgrade your system, when the 8514/ULTRA does more for a lot less.

Like nothing you've seen before.

The 8514/ULTRA delivers high resolution and eye-popping detail. With 70Hz non-interlaced display, flicker-free graphics come alive in brilliant 1024x768 resolution, and up to 256 colors.

True laser print for the screen.

Everyone talks about WYSIWYG. Only the 8514/ULTRA delivers it. ATI's remarkable CRYSTAL Fonts† scale and display Windows text in true laser quality – right on the screen. That's equivalent to 3200x2400 resolution! So even type as tiny as 6-point is clearly legible. Don't waste time and money printing and proofing page-after-page. The 8514/ULTRA lets you do it accurately on-screen.

Plus, it's register compatible with IBM's 8514/A* and software compatible with XGA* cards. And with our innovative "Flippy" design, you get Micro Channel* and AT-bus support on a single card.

The 8514/ULTRA is also available with an integrated VGAWONDER+* controller and Microsoft* compatible bus mouse.

Why not let the 8514/ULTRA open new Windows of productivity – in the blink of an eye.

Priced from \$599.**

For more information, contact your supplier, or:

ATI Technologies Inc.
3761 Victoria Park Avenue
Scarborough, Ontario
Canada M1W 3S2
Tel: (416) 756-0718
Fax: (416) 756-0720



ATI's Family of Products includes: VGAWONDER+ • VGAEDGE-16 • VGBASIC-16 • 9600etc/e • 2400etc/e • 2400etc/i

*Average speed based on PC Magazine's WINBENCH V1.1 Windows benchmark test. Results available upon request. **Suggested retail price for 512K model. 1MB versions also available. Dealers may sell for less. Copyright © 1991 ATI Technologies Inc. †Trademarks are registered by their respective companies.

NCR WaveLAN. A Revolution In LAN Technology.



NCR WaveLAN™ is a fast, 2 Mbps LAN that uses radio waves instead of cables, with a range of up to 800 feet in a typical office landscape, five miles outdoors. Spread spectrum transmission ensures security from eavesdropping, interference, and jamming. WaveLAN also eliminates expensive wiring costs, saving you as much as \$500 to \$1000 each time you move a PC. And because WaveLAN eliminates cables—the source of most LAN failures—it's far more reliable than wired LANs.



Programmers' Codices

- *HP LaserJet Programming*
by Andrew Binstock, David P. Babcock,
and Marv Luse
- *Programming the LaserWriter*
by David Holzgang

We found two books aimed specifically at users who want to learn the details of programming for laser printers, one for the Apple LaserWriter and the other for HP LaserJets (including the LaserJet III). Both of these books were made available in manuscript form only; however, each should be in the stores by the time you read this article.

HP LaserJet Programming by Andrew Binstock, David P. Babcock, and Marv Luse (Addison-Wesley, \$26.95) is intended specifically for C language programmers who need to learn how to control PCL fonts and graphics. This 400-page book is full of sample code, but it is clearly appropriate for programmers only. Casual

TRAINING TOOLS

LASER PRINTERS

users and even application-adept power users are advised to buy this book at their own risk.

David Holzgang's *Programming the LaserWriter* (Addison-Wesley, \$24.95) greets readers who might be a little less technically exalted than those who might delve into *HP LaserJet Programming*, but

unless you just want to know more about the soul of a laser printer—its page control language—this 496-page work might prove esoteric. It is intended specifically for applications developers who write code for LaserWriters using the PostScript language. The examples in the book use Think C 4.0 on an Apple Macintosh, which obviously will require an extra translation step if you work with an IBM version of C.

HP LaserJet Programming

by Andrew Binstock, David P. Babcock,
and Marv Luse

Addison-Wesley Publishing Co. Inc., Rte.
128, Reading, MA 01867; 617-944-3700.

List Price: \$26.95. **Pages:** 400 pp. **Copy-**
right: 1991. **ISBN:** 0-201-57736-4.

In Short: Designed for C programmers
who need to know how to use PCL fonts
and graphics, *HP LaserJet Programming*
should be bought only by programmers.

CIRCLE 638 ON READER SERVICE CARD

Programming the LaserWriter

by David A. Holzgang

Addison-Wesley Publishing Co. Inc., Rte.
128, Reading, MA 01867; 617-944-3700.

List Price: \$24.95. **Pages:** 496 pp. **Copy-**
right: 1991. **ISBN:** 0-201-57068-8.

TRAINING TIPS

Toner Cartridge Concerns

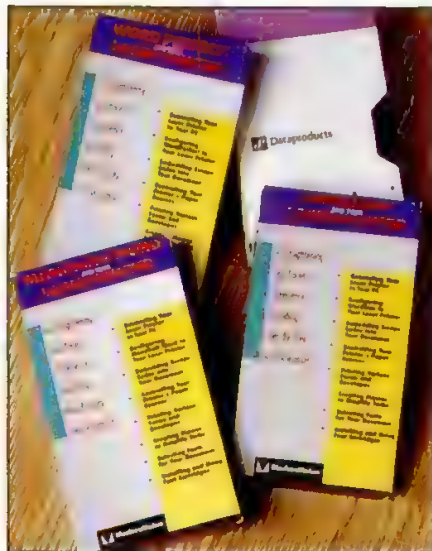


"Do not use hot water to remove toner from your skin or fabrics—the hot water simply fuses the toner in place and makes it harder to remove. Use cold water and soap to clean toner spills."

—*The LaserJet Handbook*, Second Edition, by Steven J. Bennett and Peter G. Randall, page 117

In Short: Perhaps approachable by people a little less technically adept than the average programmer, *Programming the LaserWriter* is still definitely a LaserWriter power users' volume.

CIRCLE 638 ON READER SERVICE CARD



Training Tapes

TRAINING TOOLS LASER PRINTERS

- *LZR 650—Getting Started* by Dataproducts Corp.
- *Microsoft Word and Your Laser Printer* by ModernVision
- *WordPerfect and Your Laser Printer* by ModernVision
- *WordStar and Your Laser Printer* by ModernVision

When we set out to produce this article, we expected to find a slew of videotapes for laser owners. Instead, we found only four tapes by two vendors, one a manufacturer of printers and the other a company formed specifically to help people use laser printers with word processing programs.

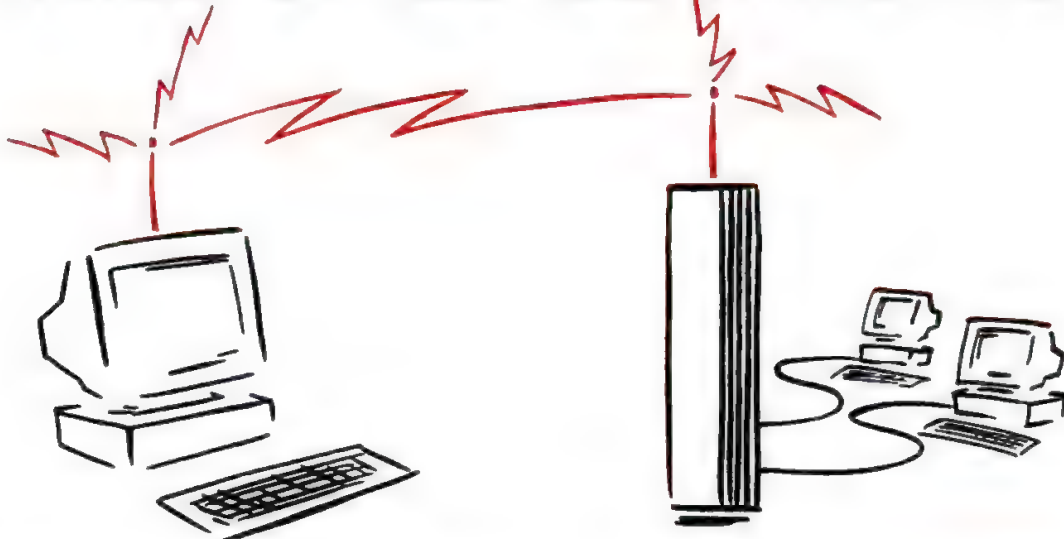
Dataproducts Corp. sells a wide variety of printers, including lasers. When you buy a Dataproducts LZR 650 (see the November 13, 1990, special issue on printers), you get a free 17-minute VHS tape that shows you how to set up the printer and use it with your computer. The tape, entitled *LZR 650—Getting Started*, is also

available separately for \$10, although there's little reason to buy it unless you own the LZR 650. Specific topics covered include printer setup with installation of consumable supplies, running the printer self-tests, using the control panel, connecting the printer to a computer, sending data from the computer (including form feeds), choosing printer emulations, and attaching the printer's optional second sheet-feeder.

The video is very clear and covers many topics in a short time without rushing. The information covered in *LZR 650—Getting Started* is the same as in the early pages of most printer manuals, so the content is not new. But seeing it all in three dimensions adds clarity that some people just can't get from a manual. And unlike most manuals, the tape does not clutter the viewer's attention with superfluous information but sticks to the basics—just what laser-printer novices need most. We hope that other laser printer companies will offer similar tapes in the future.

Responding to a need for information on using laser printers with word processing programs, ModernVision was incorporated last fall. Its express purpose is creating and selling tapes to help word

There's A Simple Connection Between WaveLAN And Your Wired LAN.



NCR WaveLAN is easy to install, and fully compatible with existing wired Novell® networks. Just add a WaveLAN board to your server. For PC installation, all you need is a PC/AT or compatible with a full-size slot available. And WaveLAN makes moving a PC as simple as picking it up and taking it where you want it to go. For a free brochure or the name of the WaveLAN dealer nearest you, phone 1 800 544-3333.

NCR is the name and mark of NCR Corporation. © 1991 NCR Corporation.

NCR

Open, Cooperative Computing.
The Strategy For Managing Change.

CIRCLE 526 ON READER SERVICE CARD

Get your colors down cold.



*Suggested U.S. list price. PANTONE is Pantone, Inc.'s check standard trademark for color reproduction. © 1991 Hewlett-Packard Company PE12104

And get a cool \$200 back.

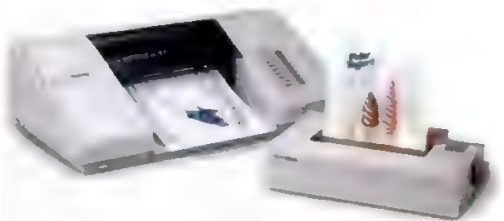


Now, for a limited time only, you'll get a \$200 rebate when you buy the affordable HP PaintJet color printer. Or, for Macintosh users, the HP PaintWriter. Both are just \$1,395*.

What's even more exciting is our new, enhanced Windows and Macintosh software drivers for color matching. So what you see on your screen is what you get. Right down to the exact PANTONE® color. And our improved inks and wider range of colors give new meaning to the presentation of a brilliant idea.

Of course, HP PaintJets and PaintWriters work with all your favorite graphics software. Print on paper as well as transparencies. And come with a full one-year warranty.

For shared use, there's the PaintJet XL at \$2,495* or PaintWriter XL at \$2,595*. Both offer faster speed, auto-sheet feed, and larger formats.



So call 1-800-752-0900, Ext. 2112 for your nearest authorized HP dealer. And find out where to get a firsthand demonstration of what the PaintJet family can do for your business communications.

But act fast. Our rebate offer expires May 31, 1991. And we wouldn't want to leave anyone out in the cold.



**HEWLETT
PACKARD**

processor users upgrade easily to laser printers.

The company currently sells three tapes: *Microsoft Word and Your Laser Printer*, *WordPerfect and Your Laser Printer*, and *WordStar and Your Laser Printer*. In each case, the tapes cover the word processor's Version 5.0. The three tapes cost \$29.95 each and have similar content, varying only in the specific screens and commands used by the differ-

ent word processors. The first part of each tape covers connecting the laser printer to your computer and configuring your word processing program to work with it. The tapes include step-by-step instructions for connecting and configuring printers via serial ports—often a confusing task. Program-specific information includes paper selection, using macros for paper and font

selection, and the use of font cartridges.

The ModernVision tapes are intended for people who are already familiar with their computers and word processors and who are upgrading to laser printers. The tapes use IBM, Hewlett-Packard, and Dataproducts laser printers as examples but never mention the brands by name; instead, they stress the similarities between laser printers. Viewers are referred to printer operations manuals for printer-specific information.

Each tape includes a topic index with reference numbers on the back of the case. The index numbers are constantly displayed in the lower right-hand screen cor-

Q. What do the following three companies agree on:



UNISYS

ZENITH
data systems

Groupe Bull

A. ZSTEM Terminal Emulation

AT&T, Unisys and Zenith agree that KEA's ZSTEM is the best VT emulator for their US government contracts* KEA's ZSTEM series of terminal emulation and communication products has been satisfying strict government contract requirements for seven years.

ZSTEM 240 offers full VT241 emulation with VT340 extensions. ZSTEM 240 runs under both MS-DOS and UNIX 386 System V, letting you convert your MS-DOS PCs to UNIX System V without losing access to your VAX. ZSTEM 240 supports all standard video adapters: VGA, EGA, CGA, MCGA, AT&T, Hercules and many extended adapters. No matter what video adapter/monitor combination you use, ZSTEM 240 displays double-high/double-wide characters, 132 columns, and VT340 ReGIS, sixel and Tektronix graphics.

ZSTEM 240 connects to your favorite networks, including Novell, 3COM, TCP/IP, Ungermann-Bass, Excelan, Wollongong, FTP, Sun and DEC's CTERM and LAT.

With KEA's top-notch technical support and documentation, plus a solid warranty, you can be assured of quality products backed by quality people. Call today about KEA's complete line of VT emulation and network products.

KEA Systems Ltd.
Orders: 1-800-663-8702
Phone: (604) 431-0727
Fax: (604) 431-0818

Coming soon:
ZSTEM 320/340
and
KEAterm 420
for MS-Windows



*ZSTEM 240 is available from AT&T on SMSCRC. ZSTEM 220 for MS-DOS and ZSTEM 220 for UNIX are available from Unisys on Desktop III. ZSTEM 100 and ZSTEM 240 are available from Zenith Data Systems on GSA schedule.
KEA Systems Ltd., 3738 North Fraser Way, Unit 101, Burnaby, BC, Canada V5J 5G1
Regional Office: 314 East Holly Street, Suite 106, Bellingham, WA, USA 98225.

ZSTEM and the KEA logo are trademarks of KEA Systems Ltd. All other brand and product names are trademarks or registered trademarks of their respective holders.
©Copyright KEA Systems Ltd., 1991. All rights reserved.

CIRCLE 271 ON READER SERVICE CARD

TRAINING TIPS



All About Fonts

"Whether of the two-character or of the parameterized type, there are several ways to send the PCL-command escape sequences to the printer. With the exception of graphics and font files, the HP LaserJet printer accepts commands and data in the form of ASCII strings. Many of today's word processors allow user-entered printer escape sequences to be sent from within a document as 'printer instructions.' Alternatively, ASCII editors and word processors that can produce the ESC character can be used to create a file consisting of nothing but the command sequence."

—Lab Notes, by Jay Munro,
PC Magazine, January 29, 1991,
page 337

ner when the tape is playing—helpful if you want to fast-forward or rewind the tape to a particular topic.

These tapes cover lots of ground in 70 minutes, but the level of detail is just about right, given the time people are probably willing to spend and the complexity of the subject. The index numbers for fast reference are a particularly good idea.

Whether you can benefit more from books or tapes, the market for third-party training aids is growing. As a general guide, videotapes are more appropriate for one-time multiple-person tutorials, while books can remain on a handy shelf as a convenient reference in times of need.

TRAINING TOOLS
LASER PRINTERS

LZR 650—Getting Started

Dataproducts Corp., 6200 Canoga Ave., Woodland Hills, CA 91367-2499; 818-887-8000.

List Price: \$10.00 (free with the Dataproducts LZR 650 laser printer). **Format:** VHS video cassette. **Tape Length:** 17 minutes. **Copyright:** 1989.

In Short: A must-see if you use an LZR 650, *LZR 650—Getting Started* is appropriate for simultaneously educating a number of people on the basics of laser printer care. We hope other manufacturers will follow Dataproducts' lead.

CIRCLE 640 ON READER SERVICE CARD

Microsoft Word and Your Laser Printer WordPerfect and Your Laser Printer WordStar and Your Laser Printer

ModernVision, 24307 Magic Mountain Pkwy., #337, Valencia, CA 91355; 805-257-8033.

List Price: \$29.95 each. **Format:** VHS video cassette. **Tape Length:** 70 minutes each. **Copyright:** 1990.

In Short: These videotapes will resolve any problems between your favorite word processor and printer in next to no time. They will teach you all the basics, but for anything advanced, you will have to go back to the bookshelf.

CIRCLE 641 ON READER SERVICE CARD

BEYOND THE BOOKSHELF

Armed with the training tools covered in these pages, you're sure to satisfy the needs of every laser user in your workplace. Also, don't forget to look into local training seminars (too regional for us to review here). And don't forget the *LaserJet Journal*, which is filled with valuable information.

As always, our own coverage of printers will provide an ongoing education in printer technology. In an upcoming article on HP's new IIISi, we'll diagram how the printer handles networking. And this year's printer issue will certainly include technical discussions and diagrams to keep you up to date on the latest developments. Finally, throughout the year, *PC Magazine* will be publishing articles like this one on training tools for such products as *WordPerfect* and Novell's *NetWare*. ■

Bruce Brown is a contributing editor of PC Magazine and a six-year veteran of our annual special issue on printers. Additional reporting for this story was done by Oliver Rist, a staff editor at PC Magazine.

Hassle-Free Printer Sharing

for the HP LaserJet II, IID, III and IIID



"The ServerJet is the smoothest and most practical way I know to share a LaserJet."

Frank J. Derfler, Editor
PC Magazine, 1/15/91

Here's how you and your co-workers can have your own HP LaserJets without breaking the corporate budget.

It's called **SimplAN ServerJet**.

Simply plug the *ServerJet* into the 'Optional I/O' slot of your HP LaserJet. Stretch phone cable, up to hundreds of feet, to each computer. Then, 12 people can simultaneously *whooshhh* documents to the LaserJet at speeds as fast as 115,200 baud.

No more wandering down the hall with floppy in hand.

Or borrowing someone else's LaserJet.

Or wasting time waiting to print.

The *ServerJet* is available in a variety of models with up to 4MB of buffer memory. And because your office may have printers other than HP LaserJets, ASP Computer Products offers a complete line of printer sharing solutions.

To order your *ServerJet* or for more information call ASP at:

800-445-6190



ASP COMPUTER PRODUCTS, INC.

1026 W. Maude Avenue, Suite 305
Sunnyvale, California 94086
Phone: 408-746-2965 • Fax: 408-746-2803

SimplAN & ServerJet are trademarks of ASP Computer Products, Inc. / HP LaserJet is a registered trademark of Hewlett-Packard Co.

CIRCLE 727 ON READER SERVICE CARD

Rock Solid Quality,

Introducing Service Plus

OUR NEW 3-YEAR EXTENDED
WARRANTY PLAN INCLUDES:

- GUARANTEED THREE-YEAR
when you upgrade to a more
powerful PC Brand Solution.
- 100% PARTS AND LABOR
COVERAGE
- ON-SITE SERVICE BY TECH

3-Year Plan Also Available!
Ask for Details and Prices.



PC BRAND

Rock Bottom Price.

"The Best Low Cost Alternative Around"

PC Magazine,
PC Brand 386/25,
Product Review



"...Flawless Compatibility, Lowest Price."

InfoWorld,
PC Brand 386/33,
Product Review

386/25 Non Cache and 386/33 Cached ISA Systems

386/25 Non Cache Base System 386/33 Cache Base System

Customize with the Video and Hard Drive options of your choice

- True 25MHz or 33MHz Intel 80386 CPU operating with Zero Wait States
- Landmark Speeds:
33.6MHz (386/25 Non Cache)
58.7MHz (386/33 Cache)
- Norton SI 28.2 (386/25 Non Cache)
45.9 (386/33 Cache)
- 1MB RAM (expandable to 16MB)
- 1.2MB or 1.44MB Floppy Drives
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

25MHz **\$1,249**

33MHz Cache **\$1,499**

386/25 Non Cache SVGA Package 386/33 Cache SVGA Package

This preconfigured package includes all the features of our base system with:

- 4MB RAM (expandable to 16MB)
- 89MB/19MS Hard Drive (386/25 Non Cache)
- 125MB/19MS Hard Drive (386/33 Cache)
- 14" Super VGA (1024 x 768 Resolution) Color Monitor
- 16 Bit High Performance Super VGA Card with 1 MB Video RAM
- 1.2MB and 1.44MB Floppy Drives
- High Resolution Mouse

25MHz **\$2,672** Lease: **\$103/month***

33MHz Cache **\$3,068** Lease: **\$118/month***

All Systems also include: On-Site Service by TRW[†], Our Unique 5 Year Warranty, Unlimited Toll-Free Service and Support, Our 60-Day^{††} No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

PC Brand Will Customize Any System to Your Exact Specifications, with name brand products from vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

Leasing Plans Available through Eaton Financial Corp., A Subsidiary of AT&T Credit Corp. *Monthly Payment Based on 36 Month Lease.

Standard Features

- True 25 or 33MHz Intel 80386 CPU Operating with Zero Wait States
- Direct Map Cache Processor with 64K Static RAM on 386/33 Cache System
- 1MB RAM expandable to 16MB on the System Board
- 1:1 interleaved Hard/Floppy Drive Controller, with 1MB/second disk transfer rate
- 1 Parallel and 2 Serial Ports
- High capacity 200 Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery
- 387[™] or Weitek Co-Processor Support

- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, UNIX, NOVELL, 3COM, and PCNET compatibility
- 8 Slot Motherboard Design (7 16bit & 1 8bit for 386/25) (6 16bit & 2 8bit for 386/33 Cache)
- Medium Footprint Desktop Case with 6 Disk Drive Bays

Hard Drive Options

- 44MB/28MS
- 89MB/19MS
- 125MB/19MS
- 177MB/15MS
- 200MB/16MS
- 320MB/16MS
- 840MB/16MS

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640 x 480)
- Super VGA Color (1024x768)

Call 1-800-PC Brand

TEL 1-800-722-7263 FAX 1-800-722-7392

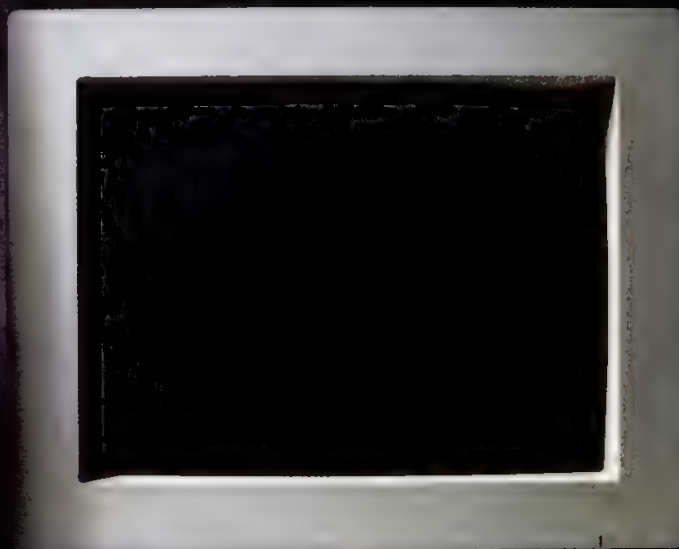
PC Brand, Inc. 877 Supreme Drive, Bensenville, IL 60108
International Fax #708-616-2888 International Voice #708-860-2300.
We are open Mon. thru Fri.: 7am to 7pm; Saturday 8am to 4pm Central Time.
MasterCard, VISA, Discover, PC Brand Direct Advantage MasterCard, Checks
& Approved P.O.s Accepted. Prices & specifications subject to change.

386, 387, SX, and 486 are Trademarks of Intel Corporation

[†]TRW-National Computer Maintenance Services-Free on site service for 386/SX, 386/DX, and 486's for customers located within a 100 mile radius of any of over 200 TRW service centers. On site service for 286's available at extra cost. Call for details. ^{††}60-day return for 386/33 InfoWorld Recommended System.

PCM891

Rock Solid Service,



PC BRAND

Rock Bottom Price.

486/25MHz and 486/33MHz Cached ISA Systems

Service Plus

OUR NEW 5-YEAR
EXTENDED WARRANTY
PLAN INCLUDES:

**GUARANTEED
TRADE-INS**

When you upgrade to
a more powerful
PC Brand System

**100% PARTS AND
LABOR COVERAGE**

**ON-SITE SERVICE
24/7**

4 Year Free On-Site Service
Ask for Service Plus Plan

"The PC Brand
486/33 showed
better speed and
expansion than
machines costing
twice as much.
For a good number
of users, the search
for a 486/33 will
end with this
machine."

PC Magazine,
PC Brand 486/33,
Product Review

486/25 and 486/33 Base Systems

Customize with the Video and Hard Drive
options of your choice

- True 25MHz or 33MHz Intel 80486 CPU operating at Zero Wait States
- Landmark Speeds:
114.1MHz (486/25), 150MHz (486/33)
- Norton SI 41.5 (486/25), 51.5 (486/33)
- 1MB RAM (expandable to 32MB)
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

25MHz **\$1,949**

33MHz **\$3,399**

486/25 and 486/33 Super VGA Packages

This preconfigured system includes all the
features of our base systems with:

- 4MB RAM (expandable to 32MB)
- 125MB/19Ms Hard Drive
- 14" Super VGA (1024 x 768 Resolution)
Color Monitor
- 16 Bit High Performance Super VGA Card
with 1MB Video RAM
- 1.2MB and 1.44MB Floppy Drives
- High Resolution Mouse

25MHz **\$3,518**

33MHz **\$5,038**

Lease:
\$135/month*

Lease:
\$176/month*

All Systems also Include: On-Site Service by TRW¹, Our Unique 5 Year Warranty, Unlimited Toll-Free Service and Support, Our 30-Day No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

PC Brand Will Customize Any System to Your Exact Specifications, with name brand products from vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

Leasing Plans Available through Eaton Financial Corp., A Subsidiary of AT&T Credit Corp. *Monthly Payment Based on 36 Month Lease.

Standard Features

- True 25MHz or 33MHz Intel 80486 CPU Operating at Zero Wait States
- 1MB RAM expandable to 16MB
- Built-in 8K 4-Way Set Associative Cache
- Built-in Intel 487 Numeric Coprocessor
- Optional 128K or 256K auxiliary CPU Cache Card
- Optional Weitek Card
- 1:1 interleaved Hard/Floppy Drive Controller, with 1MB/second disk transfer rate
- 1 Parallel and 2 Serial Ports
- High capacity 200 Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery

Hard Drive Options

- 8 Slot Motherboard Design (7 16bit & 1 8bit)
- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, UNIX, NOVELL, 3COM, and PCNET compatibility
- Medium Footprint Desktop Case with 6 Disk Drive Bays
- 44MB/28MS
- 89MB/19MS
- 125MB/19MS
- 177MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640 x 480)
- Super VGA Color (1024x768)

Call 1-800-PC Brand

TEL 1-800-722-7263 FAX 1-800-722-7392

PC Brand, Inc. 877 Supreme Drive, Bensenville, IL 60106
International Fax #708-616-2888 International Voice #708-890-2300.
We are open Mon. thru Fri.: 7am to 7pm; Saturday 8am to 4pm
Central Time. MasterCard, VISA, Discover, PC Brand Direct
Advantage MasterCard, Checks & Approved P.O.s Accepted. Prices
& specifications subject to change. 386, SX, 387, 486 are
Trademarks of Intel Corporation.

¹TRW-National Computer Maintenance Services-Free on site service for 386/SX, 386/DX, and 486's for customers located within a 100 mile radius of any of over 200 TRW service centers. On site service for 286's available at extra cost. Call for details.

PCM891



WHEN THE GOING GETS TOUGH, THE TOUGH GET FASTER.

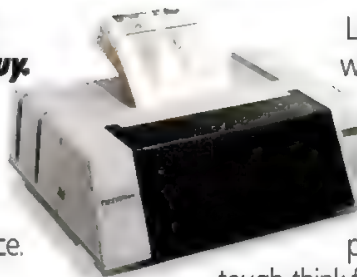
Introducing Performax™, the fastest, toughest forms printer money can buy.

Imagine a printer designed to print at lightning speeds on the toughest media around. Six-part forms. Stiff card stock. Bulky, adhesive-backed labels. All flying through at speeds up to 622 cps. Now that's performance. That's Performax, new from Datasouth.

Performax has what it takes to print forms quickly and easily. Features like a straight paper path to prevent bunching and jamming. Plus a zero tear off bar for demand document applications.

The front panel keypad stores up to four different print profiles to switch instantly to a different style of form. And Performax shifts easily to feed cut sheet documents—parking and reloading continuous forms at the touch of a button.

Performax even prints bar codes and industrial graphics.



Like all Datasouth printers, Performax is built to withstand a round-the-clock duty cycle. All for less than the price of a low-end line printer. In short, Performax is the toughest, most versatile, high-speed forms printer around.

So if you're thinking about a forms printer, don't just think tough, think fast. Think Performax.

Performax

Call **1-800-476-2120** for more information.



Datasouth

AMERICA'S HIGH PERFORMANCE
PRINTER COMPANY

P.O. BOX 240947, Charlotte, NC 28224 • (704) 523-8500 • Tlx: 6843018 DASO UW • Sales: 1-800-476-2120 • Service: 1-800-476-2450

© 1991 Datasouth Computer Corporation. Performax is a trademark of Datasouth Computer Corporation.

CIRCLE 281 ON READER SERVICE CARD

BUILDING
WORKGROUP
SOLUTIONS

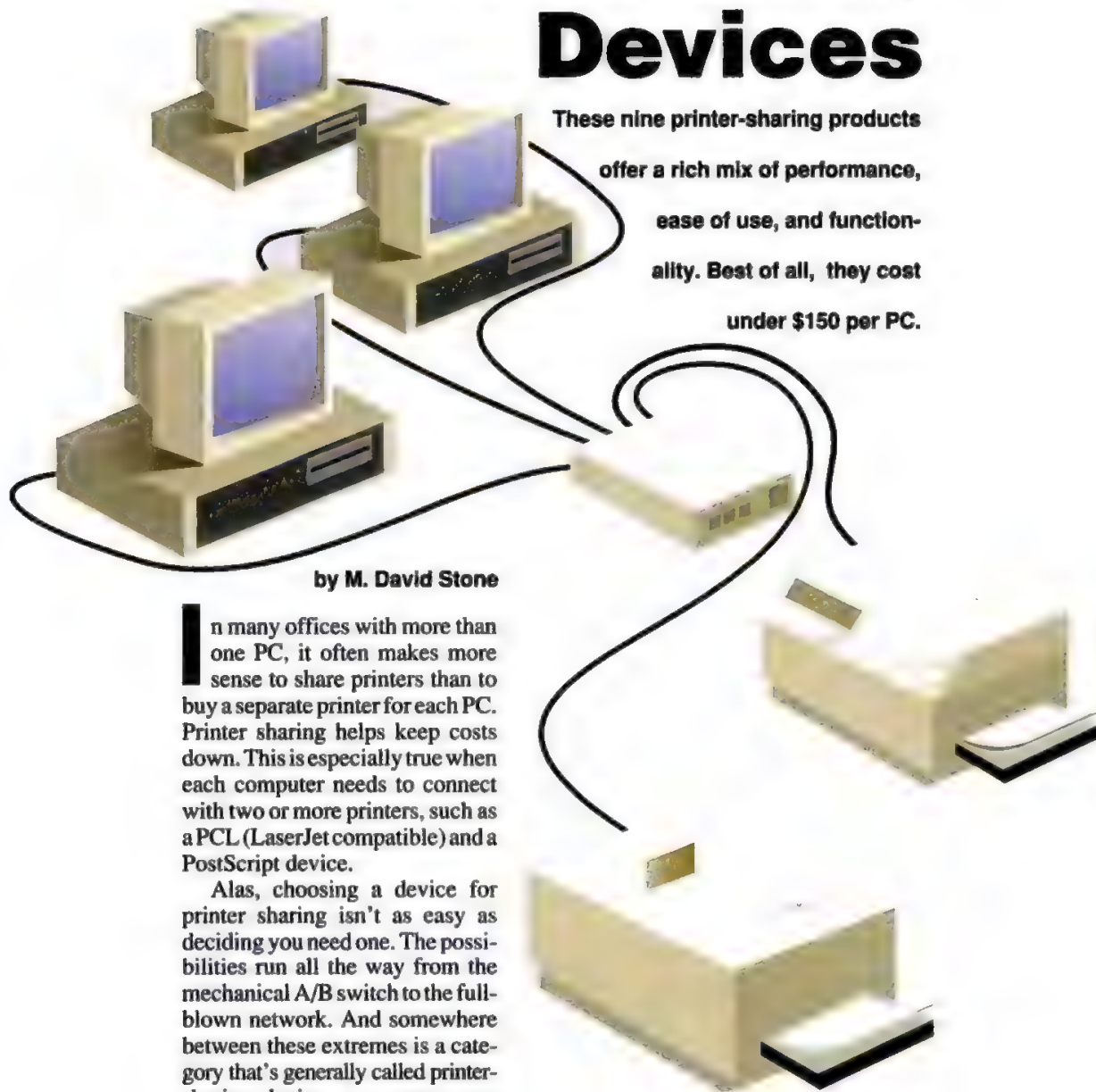
Buffered Printer-Sharing Devices

These nine printer-sharing products offer a rich mix of performance, ease of use, and functionality. Best of all, they cost under \$150 per PC.

by M. David Stone

In many offices with more than one PC, it often makes more sense to share printers than to buy a separate printer for each PC. Printer sharing helps keep costs down. This is especially true when each computer needs to connect with two or more printers, such as a PCL (LaserJet compatible) and a PostScript device.

Alas, choosing a device for printer sharing isn't as easy as deciding you need one. The possibilities run all the way from the mechanical A/B switch to the full-blown network. And somewhere between these extremes is a category that's generally called printer-sharing devices, or, more accurately, buffered printer-sharing devices.



CONNECTIVITY

PRINTER-SHARING DEVICES

For this overview, we look at nine such products: the Buffalo SL-512 from Buffalo Products, Super Spooler II from Consolink, PrintDirector Silver PDSSP from Digital Products, PrintPoint 6x2 from Excellink, The Logical Connection from Fifth Generation Systems, Data Manager XL-100 from IMC/Data Manager, Byte-way 1000 Plus 8P1MB from Protec Microsystems, Data Shuttle 8400 from Q4 Instruments, and FastPrint 8S2U/5X from Rose Electronics.

REVIEW CRITERIA

To be included in this review, a printer-sharing device had to support a minimum of two parallel printers and six PCs, with one of the computers located at least 100 feet away. It had to handle PostScript files and manage graphics files of at least 500K. It also had to give users a way to select between printers and the ability to print simultaneously from all six computers. Finally, the price had to be less than \$150 per PC port—not including the cabling. The total price, before cabling, had to be below \$1,200, regardless of the number of PC ports.

Extended Systems' Sharespool and Western Telematic's Lasernet PSU82SP were not included because they were unable to directly support two parallel printers. The units that ASP and Belkin were offering at the time of our testing were excluded because they were OEM versions of Excellink's product, PrintPoint 6x2. Similarly, Black Box's Micro-Switch 9 Plus is an OEM version of an earlier Rose Electronics model.

WHAT'S HERE

Buffered printer-sharing devices, or more simply, printer sharers, are distinguished from simple mechanical and electronic switches in that they are essentially invisible to the user. The process of printing with a printer sharer shouldn't be any different for the user than it is with a direct connection to a printer. The exception occurs when you're sending a specific command, such as directing a particular print job to a color printer, to the unit. Unlike the user of an unbuffered switch, you don't have to worry whether a given printer is occupied before you print from your PC. The printer sharer accepts multiple print jobs in its buffer and sends them to the printer when appropriate.

At the other end of the spectrum, printer sharers are distinguished from networks (in the widest sense of the word)

in that their main purpose is to let you share printers. As usual when defining categories, the line between printer sharer and network, though somewhat arbitrary, is clear. So, some products in this overview—including the Data Shuttle 8400 from Q4 Instruments—have commands that will let you connect any port to any other. Once connected, you can use any standard communications program to transfer files between PCs. The package itself, however, does not provide any file-transfer features, which leaves it well within the printer sharer category.

Once a product of this type integrates file transfer and other LAN-like capabili-

One of the items to keep in mind when tallying up the cost of any printer sharer is the price of cables.

ties such as e-mail, it crosses the line into hardware-based slotless LANs (see the sidebar "Printer Sharing Plus: Five Hardware-Based Zero-Slot LANs"). Although these products have more capabilities than do straightforward printer sharers, they are priced about the same. The cost comes in the added complexity of the software, which can make operating these devices less transparent to the user. Once installed, printer sharers are essentially invisible; zero-slot LANs are not.

Within the category of buffered printer sharers, there are actually two groups: dedicated printer sharers and data switches. Dedicated printer sharers—such as the PrintPoint 6x2, the Byte-way 1000 Plus 8P1MB, The Logical Connection, Super Spooler II, Data Manager XL-100, and the FastPrint 8S2U/5X—are limited to connecting specifically designated input ports (for workstations) to specifically designated output ports (for printers). Data switches—such as the Data Shuttle 8400, PrintDirector Silver PDSSP, and Buffalo SL-512—can connect any port to any other.

Besides letting you transfer files between PCs, data switches will let you communicate to and from a port with a modem attached, thus providing modem sharing in addition to printer-sharing facilities—if you have the appropriate software. In short, a data switch is a little more sophisticated than a dedicated printer sharer. In choosing a package, you should first decide whether you need printer sharing only or whether you really need a data switch (see the diagram "A Printer-Sharing Decision Guide").

THE ATYPICAL PACKAGE

The products in this roundup have almost as many significant differences as they have common features. On the software side, most but not all come with a control program to let users pick printers or give other commands from a menu. Some of those will let you edit the menu choices and the commands that go with them. Most control programs can run either as a foreground program or as a TSR.

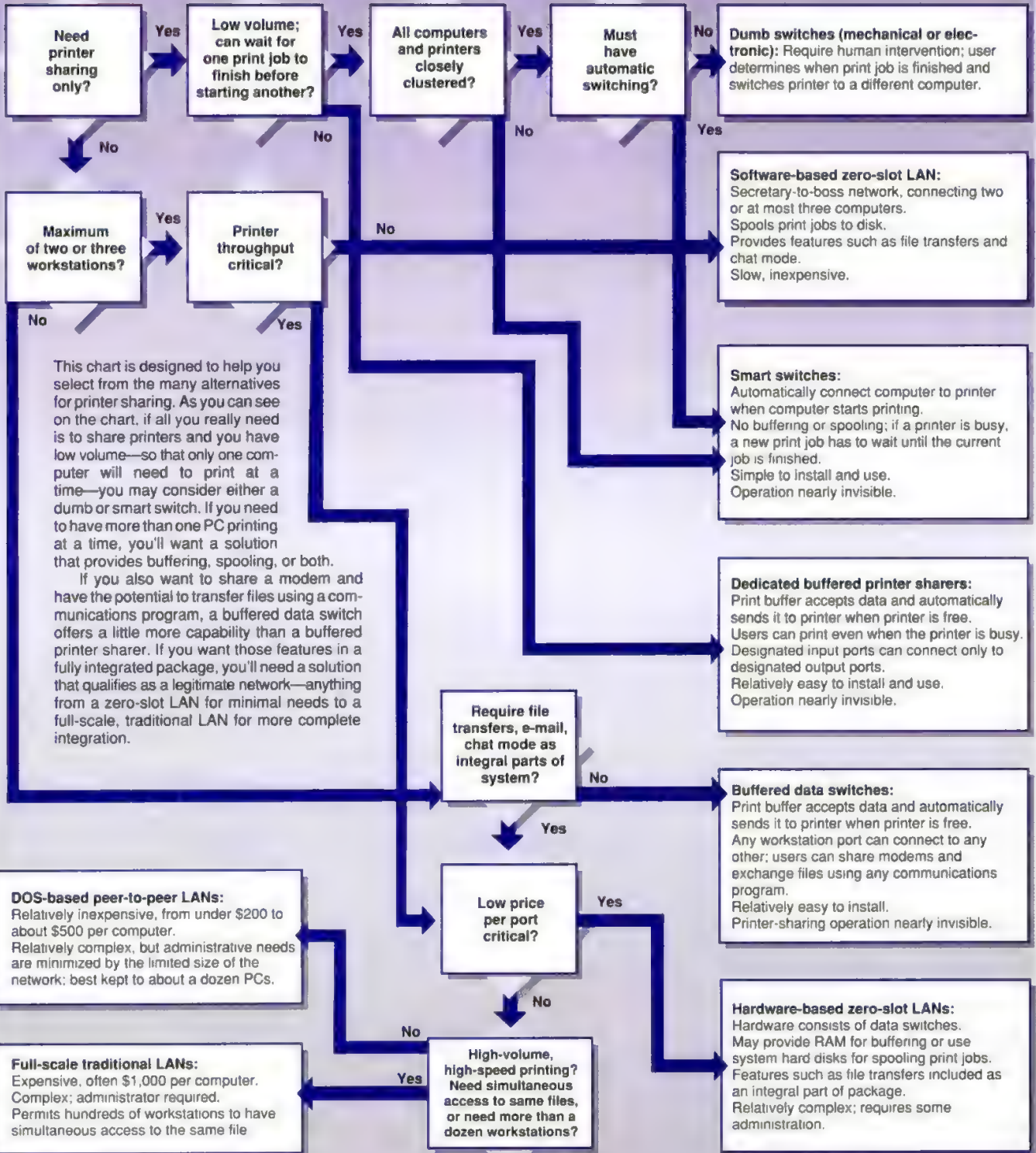
On the hardware side, the differences are more significant. Consider printer ports, for example. To be included, all these packages had to handle two parallel printers. But you'll find that some are limited to two output ports, while others will let you define any port as an output port. Input ports for PCs vary as well. You'll find packages with parallel ports only, serial ports only, and a mix of both (see "Printer-Sharing Devices: Cables and Connections").

One of the items to keep in mind when tallying up the cost of any printer sharer is the price of cables. Among these products there is little standardization for types of cables and connectors. Some use relatively inexpensive telephone-style flat-wire cables with modular plugs. Others use costly computer-style 25-wire cables with DB-style and Centronics connectors. Of the nine products in this roundup, only two come with even a single cable included in their standard price. For our tests, we asked the manufacturers to supply the appropriate cables for six PC connections; we supplied them ourselves when necessary.

The price difference for different kinds of cables can be dramatic. We checked prices at a New York-area store and got quotes for a custom 100-foot cable that ranged from \$17 for a four-wire telephone-style flat cable to \$174 for a 25-wire computer-style cable. For a 6-foot cable, the price ranged from \$7.60 for a

CONNECTIVITY PRINTER-SHARING DEVICES

A PRINTER-SHARING DECISION GUIDE



telephone-style cable to \$17.00 for a 25-wire computer-style cable. With telephone-style cable, you'll need an adapter in order to connect the modular plug to a computer or printer serial port. Expect to pay about \$10, which means that at shorter lengths, the savings gained by using flat-wire cable begin to disappear.

ALL ABOUT CABLES

Cabling is a complex subject, as anyone who has ever struggled with a serial port connection knows. Among the more standard types of cables that are put to use in several of the units are the straight-through cable, the standard parallel cable, and the null-modem cable.

A *straight-through cable* is one that's configured so that pin 1 on one connector is wired to pin 1 on the other, pin 2 is wired to pin 2, and so forth. You'll find straight-through cables for both parallel and serial connections. Often the only difference is in the type of connectors on the cable (PCs

CONNECTIVITY PRINTER-SHARING DEVICES

use female connectors for parallel ports and male connectors for serial ports). However, serial cables may also have only 9 wires rather than 25. Note that for a serial cable, the term *straight-through* assumes that the cable has either a DB-25 on each end or a DB-9 on each end. The two kinds of connectors use different pins for particular functions, so a cable with both a DB-25 and a DB-9 wouldn't actually be wired straight through.

Parallel printer cables for PCs are reasonably well standardized, despite some variations. In this context, however, a *standard parallel cable* is one that you would normally plug in directly between your printer and your PC, with a male DB-25 on the PC side. For our tests, we supplied our own printer cables, since all these units use standard cables with parallel printers.

A *null-modem cable* is one that crosses

two or more lines so that, for example, pin 2 on each connector is wired to pin 3 on the other. Since there is no one standard for a null-modem cable, this term describes a cable type rather than a specific wiring scheme.

The basic choices for telephone-style cable are 4-, 6-, and 8-wire. Any of these cables can be either straight-through or crossover, and any given unit can use either one, as long as the DB-9- or DB-25-to-modular plug adapter is appropriately wired.

If you plan to buy custom cables locally, watch out for inconsistencies in terminology for the telephone-style cables. Some vendors distinguish between RJ-11 4-wire cable and RJ-12 6-wire cable, for example, while others use the term RJ-11 to refer to either. The only way to avoid confusion is to ask the vendor about the number of wires in each cable and whether the cables should be straight-through or crossover.



EDITORS' CHOICE

• PrintDirector Silver PDSSP

These nine buffered printer-sharing devices represent a variety of choices in terms of configuration and functionality. You have your choice of dedicated buffered printer sharers or buffered data switches. These units offer anywhere from 8 to 12 ports, and options include the ability to define serial or parallel port connections for either PCs or printers. While some use null-modem or straight-through cables for serial connections, and all use 25-wire computer cable for some parallel ports, others can take advantage of less costly telephone-style flat-wire cables for the serial ports.

Of the nine, Digital Products' PrintDirector Silver PDSSP wins the Editors' Choice in this roundup. With ten user-definable ports, this buffered data switch also benefits from 1MB of memory, easy installation, a TSR that offers a range of features, and special software for the system administrator that aids in reconfiguring the device and diagnosing problems. Additionally, the system proved itself an able performer on our timed performance

tests, coming in with generally above-average scores across the board despite its 19,200-bps transmission speed over its four serial connections to the PC. (Some of the others were able to operate at 115,200 bps.) It also scores high in convenience—it passed all the pass/fail tests with flying colors, including the TSR with Graphics test that thrashed most of the competition. At \$1,095, the PrintDirector Silver is priced a little above its competition at the start; the cost rises appreciably if you buy a cabling scheme similar to our test-bed configuration from Digital, so you may want to investigate other sources for cables. Aside from that caveat, the PrintDirector Silver is well worth the expense.

Honorable mention goes to Excellink's \$797 PrintPoint 6x2 and Q4 Instruments' \$971 Data Shuttle 8400. Their times on our benchmark tests were among the best overall. Both support telephone-style cabling and offer easy set-up. The Data Shuttle has more ports (12) than any other product reviewed here. The major drawbacks of these two

products are that the PrintPoint lacks a TSR that would allow for convenient control and the ability to cascade units, and the Data Shuttle was unable to pass the TSR with Graphics test. Despite its speedy scores, we also discovered that the early production model of the Data Shuttle we tested could not handle 115,200 bps on a 100-foot cable. The company says the problem is now fixed.

A mention must be made of The Logical Connection (\$495), one of the best-selling printer sharers around today. Certainly it provides easy setup, the ability to cascade units, generally reliable performance, and the assurance that comes when buying from a well-known manufacturer. But not only did it fail the TSR with Graphics test, it also couldn't pull itself out of the crowd on our timed performance tests, possibly because of the maximum 9,600-bps transmission speed over its four serial connections to the PC. It's not a bad choice by any means, but there are other products available with an edge in one or both of these areas.

WHAT'S SO SUPER ABOUT THE SUPER CARTRIDGE?

Super Cartridge

When we created the world's first total-font cartridge solution for the HP LaserJet® printer, we knew it was more than just another font cartridge.



June 19, 1989

We knew it could only be a Super Cartridge®.

Since then, we've created several more equally unique font cartridges, all of which have earned that same Super Cartridge title.

New Super Cartridge 3... Beyond PostScript

Created for use with the HP LaserJet III, IQ Engineering's new Super Cartridge 3/Professional Edition is the first cartridge of its kind. It offers users all the advantages of PostScript printing without the drawbacks of other PostScript solutions.

Unlike emulation cartridges, the IQE

Super Cartridge 3 requires no additional printer memory and lets you enjoy PostScript compatibility at the full printing speed and resolution of your HP LaserJet III printer.

Developed in HP's own PCL language, the Super Cartridge 3 contains scalable equivalents of the 35 typefaces made popular by PostScript—plus three bonus typeface families—giving you complete desktop publishing capabilities. Including the ability to send your documents to a typesetting specialist for quality output.



So, whatever you do—from word processing and spreadsheets to reports and presentations—we

have the perfect Super Cartridge to fit your needs, your network and your budget.

In fact, a single Super Cartridge may be all you'll ever need.

Best of all, the Super Cartridges feature the largest selection of high-quality fonts and font sizes, as well as the most complete range of symbols for international, technical, math and legal applications. Which is why they have earned more awards and accolades than all the other font products combined—from some of the industry's toughest critics.

Call us at 1-800-765-FONT. We'll help you find the right Super Cartridge for your needs at the authorized dealer nearest you.

Then you can see for yourself what makes a Super Cartridge so super.

Super Cartridge™

IQ ENGINEERING

Canada: 800 663 6157
Australia: (0) 380 8374 • Austria: (0) 222 757677 • Belgium: (0) 652 0010 • Brazil: (0) 212 6355 • Chile: (0) 223 2122 • France: (0) 40262282 • Germany: (0) 22031 02102 17692 • Greece: (0) 659 637 • Gulf States: (0) 71 437754 • Hong Kong: 858 6235 • Italy: (0) 4390421 • Korea: (0) 775 4188 • Mexico: (0) 207 9822 • The Netherlands: (0) 4967051 • New Zealand: (0) 499 0867 • Singapore: (0) 65 224 2689 • Spain: (0) 559 0619 • Sweden: (0) 800 123 456 • United Kingdom: (0) 1 2476744 • Yugoslavia: (0) 414 272

The Super Cartridges and IQ Engineering are trademarks of IQ Engineering. LaserJet is a registered trademark of Hewlett-Packard.

CIRCLE 325 ON READER SERVICE CARD

PRICE REDUCED \$200.00
Now With Additional Typefaces

Our 8ppm printer
earned the Okidata OK!TM
by offering you something
the LaserJet III doesn't.



The OL800: 8ppm page printer \$1499



The OL820: W/built-in font scaling \$1999



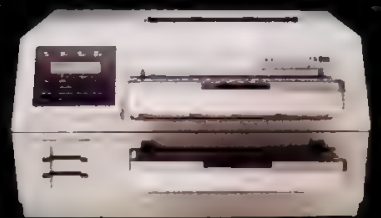
The OL840: W/PostScript \$2999



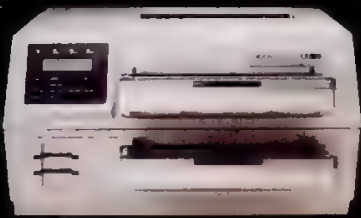
The OL800: W/200 sheet 2nd paper tray



The OL820: W/200 sheet 2nd paper tray



The OL840: W/200 sheet 2nd paper tray



The OL800: W/multi-user port (3 add'l users)*



The OL820: W/multi-user port (3 add'l users)*



The OL840: AppleTalk Network Ready

Freedom of choice.

Your best choice in an 8 ppm page printer is the one that gives you the most to choose from: the Okidata OL800 Series.

With Okidata, you're free to choose the features you need, free to save money by eliminating features you *don't* need, and even free to change your mind later.

The OL800: No Frills, But All The Options.

For only \$1499** list, the Okidata OL800 gives you a full-featured 8 ppm printer: 26 fonts, 4 typefaces, HP Series® II compatibility, both serial and parallel interfaces, and the industry's only 5-year warranty—on Okidata's unique LED printhead.

As your needs grow, you can easily add options that are *no* option with the LaserJet® III—a second paper tray for more flexible paper handling, or a network port that automatically accepts output from three additional PCs in a workgroup. You can even upgrade your OL800 to match either of our high-performance printers described below.

The OL820: Faster Than A LaserJet III.

Besides having more resident scalable fonts than the LaserJet III (13 versus 8), the OL820 also has more brains. Thanks to a unique hardware chip designed by Okidata engineers, it instantly solves complex font scaling, type rotation and grayscaling problems "on the fly"—problems the LaserJet has to go back to its software to work out.

So the Okidata OL820 can deliver up to three pages of sophisticated text while

the LaserJet III is still thinking about printing its first page. In fact, InfoWorld magazine found the Okidata OL820 to be "the fastest office printer we've tested."

Second paper tray and 4-station workgroup options are available for your Okidata OL820 as well.

The OL840: PostScript From PC To Mac And Back.

If Adobe PostScript® printing is on your menu, the Okidata OL840 offers it for \$700 less than a comparably equipped HP. Yet that low list price includes 35 genuine Adobe PostScript fonts, plus 26 bitmapped fonts (4 typefaces); 2 megabytes of installed RAM; plus serial, parallel, and AppleTalk Network® interfaces. You can connect the OL840 to both PC and Macintosh® workstations, and switch between systems instantly.

And the OL840 still leaves you with plenty of options—a second paper tray, extra memory, and a wide selection of additional PostScript fonts on easy-to-install ROM cards.

Finally, every Okidata OL800 Series printer has earned the Okidata OK!—your personal promise from us that it will deliver not just good value, but exceptional value...will provide not just adequate performance, but outstanding performance.

If you're looking for an 8 ppm page printer, your best choice is the one that gives you freedom of choice—the Okidata OL800 Series. For additional information call 1 (800) 800-7333.

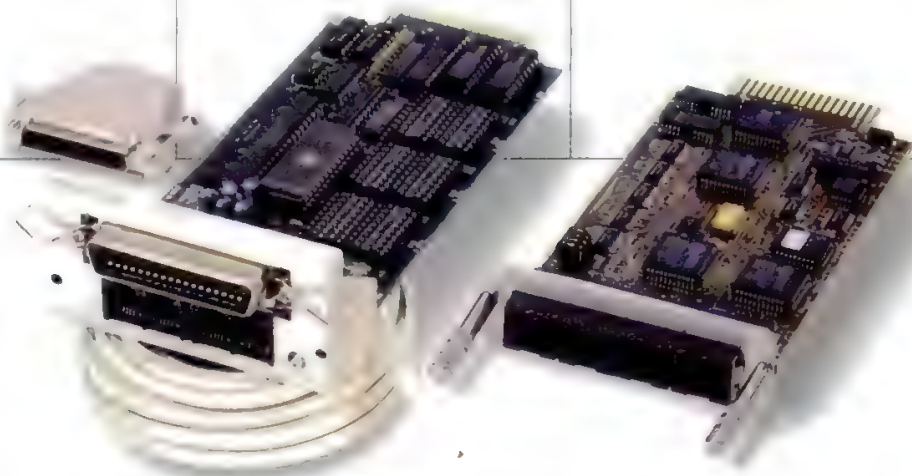


We don't just design it to work. We design it to work wonders.™

Automatic selection of PC font. *Manufacturer's suggested retail price. Dealer price may vary. HP Series, LaserJet, Adobe PostScript, AppleTalk Network, Macintosh are trademarks of their respective corporations. Okidata is a registered trademark of Okidata America Inc. Marque déposée de Okidata America Inc. Okidata OK! is a trademark of Okidata America Inc. LTD. "We don't just design it to work. We design it to work wonders." is a trademark of Okidata America Inc. InfoWorld 09/90.

There's more to comparing LaserJet printer sharing options than just the name

	Pacific Data Products Pacific Connect™	Hewlett-Packard HP ShareSpool®
Price	\$399	\$495
Upgradeable memory buffer	Yes	No
Cables and adapters included*	Yes	No
Centronics interface	Yes	No
Warranty	Lifetime	Two Years



Don't settle for less just to buy the HP name. For LaserJet printer sharing devices that offer you more features for less cost, choose **Pacific Connect** from Pacific Data Products. It's the low cost way to give up to five PC or four Macintosh users access to a LaserJet Series II, IID, III or IIID printer.

Completely transparent to users, Pacific Connect is easy to install and use. It even comes with four cables and five adapters. And to handle large print files or to spool documents sent simultaneously to the printer, its memory buffer is upgradeable from 256k to 1.25 MB.

To learn how you can get more for less, call your nearest dealer or contact Pacific Data Products, 9125 Rehco Road, San Diego, CA 92121, (619) 597-4602, Fax (619) 552-0889.



* Pacific Connect includes two 25 ft. serial cables, two 50 ft. serial cables, two DB-25 to RJ-11 connectors, two DB-9 to RJ-11 connectors, one Mini Din to RJ-11 Macintosh adapter, and PostScript® and PCL printer drivers for use with PacificPage cartridges. Prices are suggested retail list price. Pacific Connect is a trademark of Pacific Data Products, Inc. ShareSpool is a registered trademark of Extended Systems, Inc. HP and LaserJet are registered trademarks of Hewlett-Packard Company. All other company and product names are trademarks of the company or manufacturer respectively. EUROPEAN SALES OFFICES: The Netherlands, Tel (31) 20-475566, Fax (31) 20-453329 France Tel (33) 1-42669075, Fax (33) 1-42661540 England Tel (44) 442-231414, Fax (44) 442-236540 Switzerland Tel (41) 22-412650, Fax (41) 22-41068. © 1991 Pacific Data Products, Inc.

PACIFIC
DATA PRODUCTS

RANGE OF CHOICES

All told, this selection of buffered printer sharers offers a wide range of choices in price, performance, configuration, and convenience. When making your selection, keep in mind that convenience features can be just as important as raw performance, or even more so. For example, most of these packages offer the convenience of letting you cascade units to add more computers and printers. Actually, most will let you add more than might even be appropriate. If you want to cascade more than two or three units, you should rethink your needs. You may do better by breaking your users up into several individual printer-sharing groups or by implementing a network.

Being able to change printers on the fly is also an important factor for many users. If that's true for you, you'll want a product with a sturdy TSR—one that works well in graphics mode. We tested that capability using *Microsoft Word*. (This convenience isn't an issue for *Windows* users, who can open a separate window to run any of the printer control programs.) And any potential purchaser will want to pay attention to how easy the unit is to configure, or reconfigure if changes are later required. Administrative features like controlling printer access for each PC are useful if you need them but just make extra work if you don't. Whatever your needs in printer sharers, one of the units here should fill them.

BUFFALO PRODUCTS INC.

Buffalo SL-512

by Greg Pastrick

One of the nice features of Buffalo Products Inc.'s ten-port Buffalo SL-512 is the extensive control and flexibility of the SL Manager software and utilities, which may be run either nonresident or as a TSR. The SL-512 is a plain 4.5- by 12- by 7.8-inch (HWD) unit with an array of channel status lights for the four parallel and six serial connections on the back. As tested for our review, it came with 512K memory, null-modem cables for four serial PC connections, and a list price of \$660. Without cables, the unit sells for \$575.

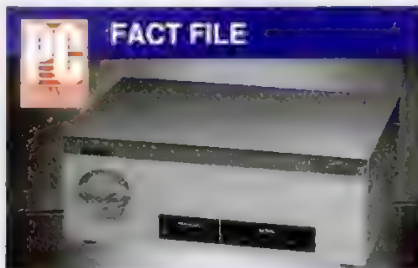
Buffalo's SL-512 is one of 35 parallel and serial buffers and switches the vendor manufactures. On this model, all ports can connect to either a PC or a printer. Memory in the unit can be upgraded from the

CONNECTIVITY PRINTER-SHARING DEVICES

base model's 256K to 4MB at \$75 per 256K, or \$200 per megabyte.

SETUP AND SECURITY

The package includes a disk with an installation program to handle the SL's software and utilities. Setup and configuration of all ports is managed under the



Buffalo SL-512

Buffalo Products Inc., 2805 19th St. SE, Salem, OR 97302-1520; 800-345-2356, 503-585-3414.

List Price: Including 512K RAM, six serial and four parallel ports, \$575; as tested, with three 15-foot serial null-modem cables, one 100-foot serial null-modem cable, \$660.

Requires: 15K RAM per PC, DOS 2.0 or later, cables

In Short: The Buffalo SL's extensive software and utilities and the manufacturer's impressive support, options, and product line outweigh some mixed performance speed results.

CIRCLE 421 ON READER SERVICE CARD

Supervisor mode, accessed on the PC connected to the device's channel 5. Hotkey selection for the 15K pop-up TSR on all PCs is user-selectable, and secure access to the Supervisor mode is controlled by password.

Once installed, the SL Manager software modifies existing AUTOEXEC.BAT files; it's wise to check them on all attached PCs to avoid conflicting commands or mode statements. You can accomplish modifications by rerunning the installation or using a DOS editor to edit the SL-512's configuration files on the PCs.

Basic operations like redirecting output and clearing the channel may be handled from the pop-up TSR in its default settings, but for more specialized tasks like sending commands for reset and form-feed, or printing multiple copies, it's recommended that you customize the standard SL macros invoked from the TSR. Like the SL-512's configuration file, the macros file may be handily altered in a DOS editor; Buffalo provides a sample file to show you how it's done.

Supervisor mode provides extensive control over all parameters and settings

LASERNET[®] PRINTER SHARING AT IT'S BEST! BEST FEATURES, BEST PRICES.

You don't need a LAN to network your printers! LASERNET's printer sharing family provides all the features you need for any requirement, at the price you want to pay.



FOR BASIC APPLICATIONS

WTI has low-cost, serial or parallel, non-buffered models, for low printer-sharing demand environments. Share from four to six PCs; perfect for the small office or school:
PSU-41A/AP - 4 inputs; single output .. **\$149**
QwikShare[®] - 6 inputs; single output; *spooling software, cables and connectors included* **\$195**



FOR GENERAL APPLICATIONS

WTI has buffered, multiple output, serial/parallel models for fast-access, high-volume printer sharing needs. User can select printer of choice directly from PC:

QwikShare II - 6 inputs; 2 outputs; buffered from 256KB to 2MB **start at \$295**
PSU-82C/SP - 8 inputs; 2 outputs; plotter, CAD, high-level graphics capability; buffered from 256KB to 2 MB **start at \$595**



FOR HIGH-LEVEL APPLICATIONS

For twelve or more users requiring high-speed peripheral sharing and file transfer, WTI has Multi-Link[™], the ultimate serial/parallel peripheral-sharing device. *Expandable through dedicated high-speed link, up to 384 any-to-any, user selectable ports, over 4,000 feet. Perform printer/plotter sharing, modem pooling, PC-to-PC communication and more:*
Multi-Link - 12 any-to-any ports; baud rates to 115K; buffered from 256K to 4 MB **start at \$795**

All products **made in U.S.A.**, backed by a **3-year** limited warranty with service and technical support.

To order* or for More Information,
Call Toll-Free

1-800-854-7226

FX 714-583-9514

**wti western[™]
telematic inc.**
5 sterling, irvine, ca 92718

TEST PATTERN.



When Multi-Tech modems are put to the test, a pattern emerges.

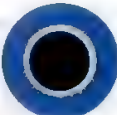
In the 1980's, the dial-up market was dominated by 2400 bps MNP-5® modems. Today, it's 9600 bps modems with V.32/V.42bis. Following that same timetable, PC Magazine awarded our MultiModem224E its EDITORS' CHOICE in May of 1987. In December of 1990, they gave the nod to our MultiModemV32.

Here's what they had to say:

"The MultiModemV32 can be configured for almost any application; it works under severely impaired lines, and it wins first prize for fast data transfers."

PC Magazine 12.11.90 (Ziff-Davis Publishing) "9600-BPS MODEMS: Breaking the Speed Barrier-PC LAN Labs tests seven rapid fire modems complying with V.32, V.42 and V.42bis standards."

If you're interested in performance, we're interested in you!
To put us to the test, please call **1-800-328-9717**

MultiTech 
Systems

The right answer every time

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, Minnesota 55112 U.S.A.
(612) 785-3500 (800) 328-9717
U.S. FAX (612) 785-9874
International Telex 4998372 MLTTC
International FAX (612) 331-3180
CIRCLE 108 ON READER SERVICE CARD

CONNECTIVITY
PRINTER-SHARING DEVICES

for the channels, including timeout interval, device and channel names, all serial parameters (baud rate, parity, data length, and so on), and output port assignment. Generally, once you've run through the routine of setting the SL-512 up, coming back to make changes is no problem at all.

Buffalo also provides a terminal emulator for troubleshooting the system and as an alternate way to enter Supervisor mode from any PC connected to the unit. You can also connect ports to each other for file transfers using any standard communications program.

We hooked up two of our own parallel cables as well as the serial cables provided by Buffalo between each of the six PCs and the device. The unit may be designated for handling input or output at transmission rates of up to 115,200 bps on serial links. But our work with the SL-512 found that for successful simultaneous printing with four PCs connected via serial ports and two PCs connected via parallel ports, 19,200 bps was the highest serial transmission rate at which the unit would run our tests. While more often than not it wound up among the slowest systems on the Time to Send tests, the product did show improvement on the Time to Print tests. Additionally, the product passed all our pass/fail tests.

Its slow sending speed aside, the SL-512 comes with extensive software controls and utilities backed up by thorough documentation that supports installing, directing, and maintaining the system under a variety of configurations. In addition, it was the only product we reviewed that went out of its way to address and document the use of its software under *Microsoft Windows 3.0*.

For a buyer of PC support products, there probably aren't many other printer-sharing outfits that offer more devices in a variety of port configurations and cable, adapter, and connector options than Buffalo Products. This fact alone gives credence to its claim of unlimited cascading possibilities—you could do it with only a small portion of their product line. And the folks at Buffalo emphasize technical support to the point of having a priority support line in addition to a toll-free number.

Buffalo provides a one-year warranty and a 45-day money-back guarantee. On the whole, there's a lot to be said for the company, and while its SL-512 may not be the speediest device around, it certainly has a number of good points in its favor.

CONSOLINK
Super Spooler II
by Kellyn S. Betts

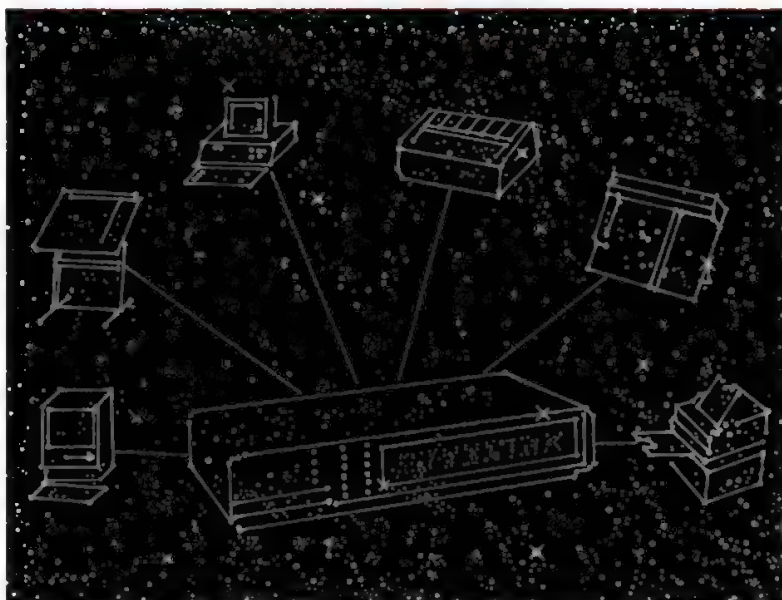
The term that best describes Consolink's Super Spooler II is "handyman special." The \$999 device can make the printers sharing it print files quickly enough, but

achieving this goal is no small feat.

The Super Spooler's purchase price buys you comparatively little: eight ports, 512K RAM, a tersely worded manual, and minimalist memory-resident software. In the unit we reviewed, the port configuration comprised four parallel and four serial ports, but Consolink says that it provides whatever combination of ports users request.

The company does not sell cables.

STAR CONFIGURATION



Discover an intelligent form of peripheral sharing.



If you're looking for a simple and cost effective way to have your computers communicate with a constellation of peripherals and with each other, your trek is finally over.

The rising star is BYTELINK from Protec Microsystems Inc., the LAN alternative that will boost your productivity by linking your equipment together.

Call today, for more on the advantages of BYTELINK
1-800-363-8156

Protec
Microsystems Inc.

SIMPLY
INTELLIGENT.

297 Labrosse, Pointe Claire (Montreal), Quebec, Canada, H9R 1A3
Tel: (514) 630-5832

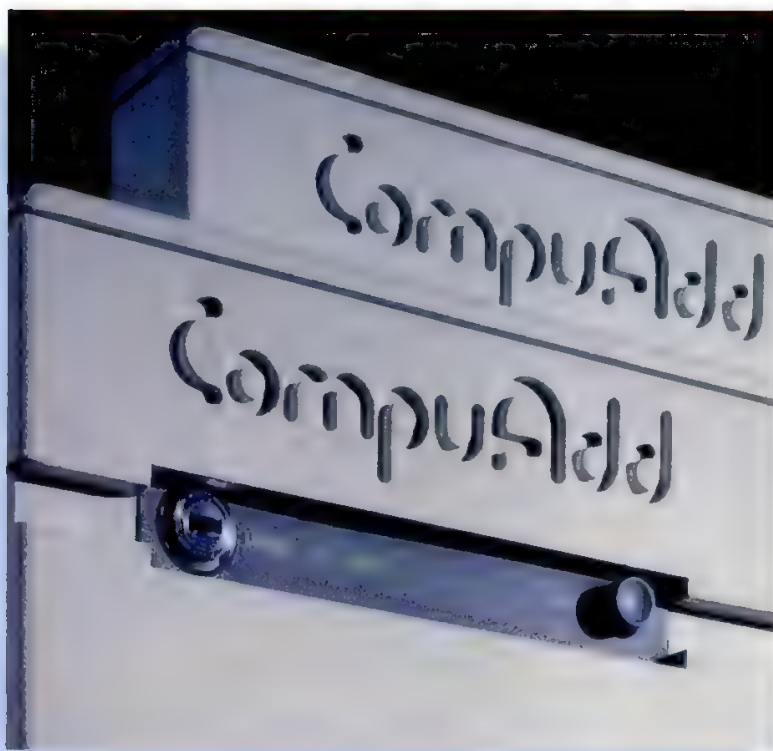
Fax: (514) 694-6973

COMPUADD 325

STAR PLAYER

"The CompuAdd 325 deserves a spot on anyone's evaluation list."

PC World, July 1990



Additional drives and monitor optional

\$1695 64834
Lease as low as \$62/mo.

CompuAdd's 25MHz 386DX is a heavy hitter!

The CompuAdd 325 can be the star player in your office! Used as a standalone workstation, CompuAdd's 25MHz 386DX blazes through Windows applications, spreadsheets, graphics and CAD. Load it up with multiple disk drives, a tape drive and the full 16MB of RAM, and you have an excellent network server! The basic 325 comes with 1MB DRAM, 32KB

high-speed static RAM cache and your choice of 3.5" or 5.25" diskette drive. Plus you get FREE CompuAdd Windows 3.0 (\$149 value), FREE CompuAdd MS-DOS 4.01 (\$89 value), FREE Microsoft Working Models and a FREE CompuAdd mouse (\$24.95 value). Choose optional monitors, hard drives and memory upgrades to suit your taste!

Call today and sign up a star — the CompuAdd 325!

325 Monitor and Hard Drive Options

	MGA	CVGA
40MB (28ms)	64973 - \$2259	64842 - \$2589
80MB (19ms)	64974 - \$2529	64843 - \$2859
110MB (19ms)	64975 - \$2629	64844 - \$2959
320MB (18ms)	64976 - \$3589	64845 - \$3919



Call 800-456-3660

Key Code 815

Hours: Monday - Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
12303 Technology, Austin, Texas 78727

Canada 800-387-3266 Mexico 95-800-010-0401 United Kingdom 0800-373535 Germany 0130-6009 France 1-40364949

COMPUADD DX SUCCESS KIT

ALL STAR TEAM

"Few manufacturers would do what CompuAdd does: it takes DOS and Windows and installs them on your system's hard disk, configuring everything so that it will run right out of the box."

PC Magazine, July 1990



Additional drives and color monitor optional

\$2295 66674

Lease as low as \$72/mo.

System, monitor, printer, software, mouse — all at one low price — a sure winner!

CompuAdd's DX Success Kit combines star players into an All-Star Team! The CompuAdd DX Success Kit features a powerful 25MHz 386DX, the CompuAdd 325, complete with 40MB hard drive that *PC Magazine* says delivers "excellent disk performance." CompuAdd's top-of-the-line kit also includes a high-performance MGA monitor and a Panasonic KX-P1180 printer — *PC Magazine* Editors' Choice! Plus you

get FREE CompuAdd Windows 3.0 (\$149 value), FREE CompuAdd MS-DOS 4.01 (\$89 value), FREE Microsoft Working Models and a FREE CompuAdd mouse (\$24.95 value).

Now there's a team you can win with! Call today and order CompuAdd's DX Success Kit!

DX Success Kit Monitor and Printer Options*

	Panasonic KX-P1180 9-pin Printer	Panasonic KX-P1124 24-pin Printer
MGA	66674 - \$2295	66686 - \$2435
CVGA	66680 - \$2625	66692 - \$2765

*Call for details on 80MB hard drive upgrade.

CompuAdd®

Customer driven. by design.

12303 Technology, Austin, Texas 78727

© CompuAdd Corporation, 1991. We accept MasterCard, VISA, Discover, money orders, certified checks and personal checks (please allow ten days for processing). CODs (\$50 minimum order), company and institutional purchase orders (minimum initial purchase \$500, thereafter \$50), and wire transfers. Please add 2% to all purchases for shipping and handling (minimum \$3; shipping outside the continental United States will increase cost). Add 8% for shipping and handling to APO/FPO addresses (minimum \$10). Please add appropriate local sales tax. Thirty-day money-back guarantee does not include return freight or shipping and handling. Opened software, videotapes, other consumables and shipping costs are nonrefundable. All return items must be accompanied by a return merchandise authorization (RMA) number. Prices and product descriptions are subject to change without notice. CompuAdd is not liable for damage due to omissions or typographical errors. Call 800-666-1872 for a copy of CompuAdd's complete warranty.

COMPUADD 316s

CompuAdd's Lowest

*If you're a bargain hunter, CompuAdd's 316s
will make your heart beat faster."*

PC World, August 1990



Additional drives and monitor optional

\$995 64787

Lease as low as \$40/mo.

Now you can get CompuAdd's 16MHz 386SX at a great bargain!

When your computing needs are ambitious but your budget and space are modest, the low profile CompuAdd 316s is a guaranteed best buy! Start with the basic 16MHz 386SX system sporting 1MB DRAM and your choice of 3.5" or 5.25" diskette drive. Select from a variety of

optional hard drive and monitor upgrades to customize your system.

Want more speed? Choose our fast 20MHz 386SX — the CompuAdd 320s. Call for pricing.

Call today for a great deal on the technology *PC Magazine* called "perfect for entry-level computer users in today's corporate market."

316s Monitor and Hard Drive Options

	MGA	CVGA
40MB (28ms)	64788 - \$1559	64793 - \$1889
80MB (19ms)	64789 - \$1829	64794 - \$2159
110MB (19ms)	64790 - \$1929	64795 - \$2259

 **Call 800-456-3660** Key Code 815

Hours: Monday - Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
12303 Technology, Austin, Texas 78727

 800-387-3266  95-800-010-0401  0800-373535  0130-6009  1-40364949

Prices Ever on 386SX!

*"There just isn't a better chip on the market than the 386,
and the 386SX is the lowest-cost model available..."*

PC Magazine, January 30, 1990



Additional drives and color monitor optional

\$1689 ⁶⁶³¹⁴
Lease as low as \$62/mo.

The CompuAdd SX Success Kit has been one of our *best sellers* since the day we introduced it! And we just dropped the price over \$200!

The SX Success Kit combines the CompuAdd 316s with a 40MB hard drive, a high-performance MGA monitor and a Panasonic KX-P1180 printer — *PC Magazine* Editors' Choice! Plus CompuAdd preloads your hard drive with **FREE CompuAdd Windows 3.0 (\$149 value)**, **FREE CompuAdd MS-DOS 4.01 (\$89 value)** and **FREE Microsoft Working Models!** Plug in your **FREE**

CompuAdd mouse (\$24.95 value), and you're ready to work right out of the box!

Don't miss these incredible savings on CompuAdd's best-selling plug-and-compute kit. And get a top-notch 386SX system from CompuAdd!

SX Success Kit Monitor and Printer Options*			
	Panasonic KX-P1180 9 pin Printer	Panasonic KX-P1124 24 pin Printer	
MGA	66114 - \$1689	66129 - \$1835	
CVGA	66118 - \$2025	66331 - \$2165	
(*Call for details on 80MB hard drive upgrade.)			

CompuAdd®

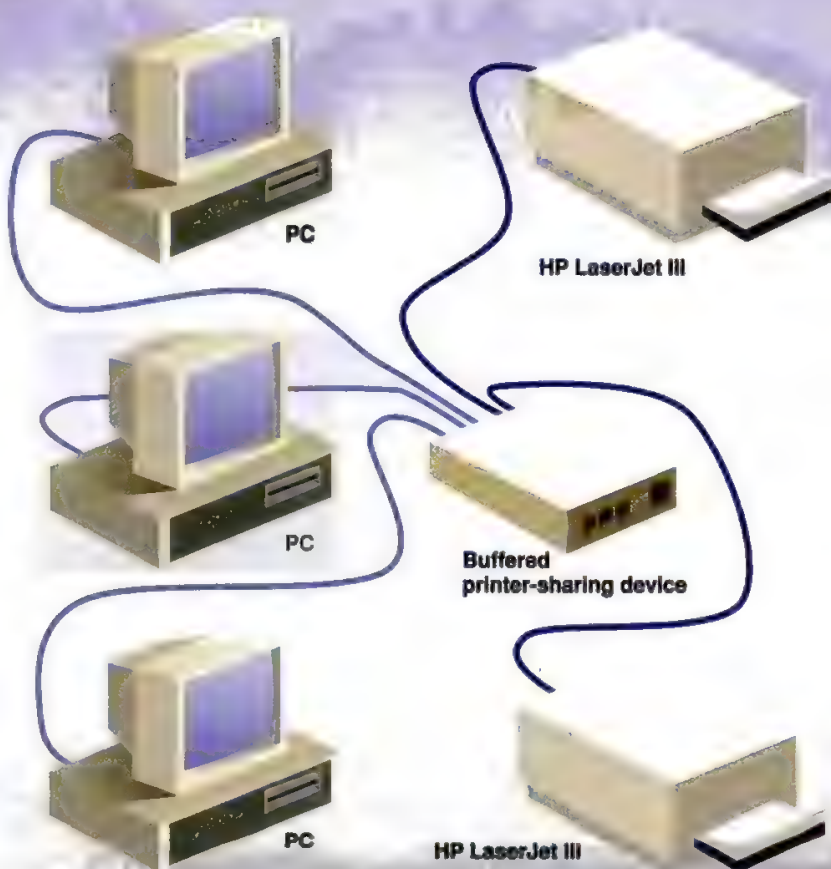
Customer driven. by design.
12303 Technology, Austin, Texas 78727

PRINTER-SHARING DEVICES: CABLES AND CONNECTIONS

Printer-sharing devices come in many varieties and with many levels of capability. For this review, we specified products that could handle two parallel printers and a minimum of six PCs connected via serial or parallel ports. That still left plenty of room for interpretation. The devices we saw had six to ten ports available for PCs, using serial ports only, parallel ports only, or more often a mix of the two.

Similarly, the cables used for connections are nothing if not various. Most printer sharers that support parallel PC-to-device connections typically use a straight-through parallel cable, but for serial links, anything from a straight-through serial cable to a null-modem cable to telephone-style wire is fair game. Additionally, the telephone-style cable may be 4-, 6-, or 8-wire, wired either straight-through or crossed over. Stability comes in the form of the standard parallel cables that generally connect a printer to these printer-sharing devices; these cables are the same kind you would use to attach your PC to a local printer.

While not all of these systems provide the user with the ability to cascade similar devices in order to add more PCs and printers, most of them do. Some even claim unlimited capability for this function, although anyone who needs to string along more than two or three of these devices should probably look at more-sophisticated options, like traditional LANs, or at least consider dividing the printer-sharing network into smaller workgroups.



Fitting this unit into a network might require more of a cabling investment than with its peers: The Super Spooler's parallel ports are all of the atypical male variety, which makes them difficult to distinguish from serial ports, and require the use of gender changers or custom cables. For our testing, our PCs used two straight-through cables for the parallel connections and four eight-wire telephone-style cables, one of them 100-foot, for the serial connections.

The biggest challenge the Super Spooler presents to users is installation and configuration. Almost all of its options must be implemented in hardware—baud rate selection, input vs. output, document-termination handling, and so on. The manual explains how to set each bank of DIP switches or shunts properly, but bases its instructions on leaving the unit as is or changing the factory defaults. Our

test unit did not arrive with these defaults, so we had a more difficult time of it, since the manual's diagrams do not adequately represent the unit as a whole. The software comes with no diagnostics, so ferreting out cabling problems could be difficult.

A BLAST FROM THE PAST

If you're getting the impression that this printer-sharing device is something of an anachronism, you're on target. At a time when personal computers were in their infancy, the Super Spooler and its 16K TSR software would have been welcomed with open arms for the mere fact that they worked competently. A plain frame houses the six very basic commands the software can issue. These allow you to connect to another device, make any necessary changes to that connection, and specify the number of



Super Spooler II

Consolink, 1840 Industrial Circle, Longmont, CO 80501; 303-651-2014.

List Price: Including 512K RAM, four serial and four parallel ports, \$999.

Requires: 16K RAM per PC, DOS 1.0 or later, cables. Hard disk recommended.

In Short: The Super Spooler's high price gets you little more than printing (not sending) speed. Obstacles like installation, configuration, and diagnostics render the whole process an unnecessary challenge.

CIRCLE 422 ON READER SERVICE CARD

Cascaded printer-sharing devices



The free ports on these devices can be available for PC or printer connections, as appropriate.

Connector schemes



A typical arrangement of ports for serial connection to PCs, with six dedicated modular connectors for the serial connection to PCs, and two dedicated female DB-25 connectors for the parallel connection to the printers.



An arrangement of connectors for a printer sharer with only parallel ports. The eight DB-25 connectors are typically female, as with the printer port on a PC.



One of several possibilities for mixing serial and parallel ports, with eight serial ports using modular connectors and four parallel ports using DB-25 connectors.

Cabling schemes

Telephone-style straight-through cable



Telephone-style crossover cable



Straight-through parallel/serial cable (pin-to-pin connections)

DB-25	DB-25
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
20	20

Null-modem cable (pin-to-pin connections)

DB-25	DB-25
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
20	20

copies you want when printing.

The Super Spooler does have one redeeming feature aside from its three-year warranty and toll-free support line: Its printing speed was generally faster than its competitors, if not always significantly so. Its sending speeds, unfortunately, weren't as fast—they ranked among the slowest. So if your program doesn't include a spooler of its own, your PC could be tied up for some time after you request a print job.

The product passed all of our compatibility tests save one, the TSR with Graphics test. (Keep in mind that many products we reviewed fell short on this test.) Though it passed our tests, the program did cause two applications (*Microsoft Windows 3.0* and *WordPerfect*) to print slower than you'd ordinarily expect. Additionally, we had to wait quite a while for the software to load under *DESQview 386*.

If you've missed the opportunity to tinker with your computing equipment and need an excuse to get your hands on some hardware, this is the machine for you. If not, there's little other than encouraging print speed to recommend this unit over its competition.

DIGITAL PRODUCTS INC.

**PrintDirector
Silver PDSSP**

by Kellyn S. Betts

Its brilliant cobalt-blue cover sets Digital Products Inc.'s PrintDirector Silver PDSSP apart from some of its more drably colored peers, but this printer-sharing device's performance and features make more lasting impressions.

Except for its color, the case housing

the version of the PrintDirector we tested is an unprepossessing plastic box festooned with LEDs on its front and ports in the back. The PDSSP model provides four parallel and six serial ports, 1MB of memory, and RAM-resident software for a list price of \$1,095.

The price rises appreciably with cabling. If purchased through Digital Products, the test-bed cabling costs \$340. We used two 15-foot parallel cables (\$45 each), and four serial connections made through telephone-style cables. The latter required eight serial DB-15 to RJ-35 converters (\$15 each), three 20-foot lengths (\$20 each) of RJ cable and one length of 100-foot RJ cable (\$70). The use of RJ-45 wire obviously has configuration advantages.

This costly cabling setup connected the PrintDirector to six PCs, as our test-bed specified. This arrangement gave us

CONNECTIVITY

PRINTER-SHARING DEVICES

PRINTER-SHARING DEVICES: SUMMARY OF FEATURES

Products listed in ascending price order

	Fifth Generation Systems Inc. The Logical Connection	Buffalo Products Inc. Buffalo SL-512	Excellink Inc. PrintPoint 6x2	Rose Electronics FastPrint 8S2U/5x	Protec Micro-systems Inc. Byteway 1000 Plus 8P1MB	Q4 Instruments Inc. Data Shuttle 8400
Price of standard configuration	\$495.00	\$575.00	\$797.00	\$799.00	\$895.00	\$971.00
Price of tested configuration	\$644.70	\$660.00	\$797.00	\$904.00	\$895.00	\$1,111.30
Dimensions (HWD, in inches)	0.9 x 14.4 x 4.3	4.5 x 12 x 7.8	2.3 x 5.3 x 8.5	3.5 x 10 x 5	2.5 x 12 x 6.8	1.8 x 10.5 x 7.5

PRINT BUFFER MEMORY

Installed RAM	512K	512K	1MB	512K	1MB	1MB
Installable RAM	256K-1MB	256K-4MB	256K-1MB	256K-2MB	256K-1MB	256K-8MB

PORT CONFIGURATION

Parallel ports dedicated to PC	2	None	None	None	1	None
Connectors (on device)	Male DB-25	N/A	N/A	N/A	Female DB-25	N/A
Serial ports dedicated to PC	None	None	8	8	None	None
Connectors (on device)	N/A	N/A	Modular	Modular	N/A	N/A
Parallel ports dedicated to printer	2	None	2	2 (serial/parallel)	1	None
Connectors (on device)	Female DB-25	N/A	Female DB-25	Female DB-25	Female DB-25	N/A
Serial ports dedicated to printer	None	None	None	2 (serial/parallel)	None	None
Connectors (on device)	N/A	N/A	N/A	RJ-45	N/A	N/A
User-definable ports (PC/printer):						
Serial	4	6	None	None	None	8
Connectors (on device)	Male DB-25	Female DB-25	N/A	N/A	N/A	Modular
Parallel	None	4	None	None	6	4
Connectors (on device)	N/A	Female DB-25	N/A	N/A	Female DB-25	Female DB-25

CABLING

PC to printer-sharing device:						
Parallel	Straight-through	Straight-through	N/A	N/A	Straight-through	Straight-through
Serial	Null-modem	Null-modem	4-wire telephone-style	4-wire telephone-style	N/A	6-wire telephone-style
Printer to printer-sharing device:						
Parallel	Standard	Standard	Standard	Standard	Standard	Standard
Serial	Straight-through	Straight-through	N/A	6-wire telephone-style	N/A	6-wire telephone-style
Cables included with standard configuration	One 8-ft. DB-25 null-modem	One 15-ft. DB-25 null-modem	None	One 10-ft. 4-wire telephone-style	None	None
Additional serial cables available	■	■	■	■	□	■
Additional parallel cables available	■	■	□	■	□	■
Maximum recommended cable length (in feet):						
Parallel connections	15	100 (PC-to-device), 400 (printer-to-device)	30	100	100	25
Serial connections	150	1,500	250	250	600	100
Boosters available to extend the distance beyond standard length	□	■	□	■	□	□

CONNECTORS

External pods for other user interfaces	□	■	□	□	□	□
Connects with:						
RS-422	■	□	■	■	■	□
OS/2 platforms	■	■	■	■	■	□
Unix platforms	■	■	■	■	■	□
Macintosh computers	■	■	■	■	■	□
Macintosh software	■	□	□	□	□	□
User can cascade printer-sharing devices	■	■	□	■	■	■

 Editors' Choice ■—Yes □—No
 N/A—Not applicable: The product does not have this feature.

CONNECTIVITY

PRINTER-SHARING DEVICES

the advantage of having two PCs with parallel connections, an easy-to-use option with this device, since all of its ports are user-definable.

Ports are defined by software during installation. In addition to printers and PCs, plotters, modems, and other PrintDirectors (for cascading) can be connected to this box. It supports serial communications of up to 19,200 bps. Installation itself is relatively simple (as long as you have the right cables and connectors and they're working properly), and greatly aided by the fact that the system's *SmallPop* software automatically tests connections after it loads.

TSR CROWDED WITH FEATURES

This 13K TSR software provides almost every feature a printer-sharing device needs, although it cannot be unloaded. Using its unchangeable Ctrl-F7 combination allows users attached to the printer-sharing device to specify the printer they wish to use and number of copies they wish to make. They also can direct the use of any fonts, special paper trays or envelopes, and duplex or simplex printing. Once specified, a printer remains in use by the PC attached to it until another printer, option, or device is specified.

The unit also includes an expanded version of *SmallPop* for use by the system administrator and *Doctor*, a diagnostics program. Site coordinators get additional utilities to allow them to install the software on other PCs, to reconfigure the PrintDirector, and create and edit user-defined functions. *Doctor*, which has a few annoying typos on its screens, tests problematic connections for every conceivable problem from the PrintDirector's ports to the connecting cables.

In our testing, the PrintDirector performed admirably—its Time to Send and Time to Print results came out above average or close to it, almost across the board. It also passed all of our compatibility tests, exhibiting very few problems with the assortment of software we used for testing it. The PrintDirector's software also works with *SideKick*, but must be loaded before it.

Digital Products offers an entire line of printer-sharing devices, including units with various combinations of 6, 10, and 15 ports. All come with a standard vendor-supplied one-year parts-and-labor warranty, plus a BBS and toll-free support

FACT FILE

EDITORS' CHOICE



PrintDirector Silver PDSSP

Digital Products Inc., 108 Water St., Watertown, MA 02172; 800-243-2333, 617-924-1680

List Price: including 1MB RAM, six serial and four parallel ports, \$1,095; as tested, with two 15-foot parallel straight-through cables, three 20-foot eight-wire telephone-style cables, one 100-foot eight-wire telephone-style cable, eight adapters, \$1,435.

Requires: 13K RAM per PC, DOS 2.0 or later, cables.

In Short: A costly cabling setup runs up the price of the tested model, but an array of exemplary features make the expense worthwhile. They include user-definability for all ten ports, above-average print times, and versatile software.

CIRCLE 423 ON READER SERVICE CARD

line, while two- and five-year warranties are available for a percentage of the list sales prices.

The PrintDirector Silver PDSSP is a printer-sharing device we can unreservedly recommend to direct the printer-sharing needs of almost any user.

EXCELLINK INC.

PrintPoint 6x2

by M. David Stone

Excellink Inc.'s PrintPoint 6x2 offers what is arguably the simplest possible approach to printer sharing. You won't find a complicated setup procedure, for example; there is little to set up. Nor will you find a TSR program for switching between printers, because the program relies wholly on batch files. You will find Spartan simplicity and generally top-flight test scores.

The PrintPoint 6x2 has six serial ports dedicated to PCs or other workstations and two parallel ports dedicated to printers. Its base price is \$650 for a system with 256K RAM, or about \$108 per workstation port, but the unit can be upgraded to as much as 1MB, at \$49 per 256K increment. Our test unit had the full 1MB, for a list price of \$797, or a price per workstation port of about \$133.

The price for the PrintPoint we tested

IMC/Data Manager XL-100	Consolink Super Spooler II	Digital Products Inc. PrintDirector Silver PDSSP
\$995.00	\$999.00	\$1,095.00
\$1,074.20	\$999.00	\$1,435.00
12 x 6 x 7	2.5 x 11 x 16.3	2.5 x 13.1 x 8
512K	512K	1MB
512K-4.5MB	256K-1MB	1MB-4MB
None	None	None
N/A	N/A	N/A
None	None	None
N/A	N/A	N/A
None	None	None
N/A	N/A	N/A
None	None	None
N/A	N/A	N/A
8	4	6
Modular	Male DB-25	Female DB-25
2	4	4
Female DB-25	Male DB-25	Female DB-25
Standard 6-wire telephone-style, straight-through	Straight-through 8-wire telephone-style, straight-through	Straight-through 8-wire telephone-style, straight-through
Standard 6-wire telephone-style, straight-through	Standard Straight-through	Standard Straight-through
Three 10-ft. 6-wire telephone-style	None	None
■	□	■
■	□	■
25	16	15
1,000	100	200 (9,600 bps), 100 (19,200 bps)
■	□	■
□	□	□
□	■	■
■	■	■
■	□	□
■	■	■

CONTINUES



When you build a better mouse

Microsoft® Mouse devotees number over 6 million, and counting.

Just what kind of mouse inspires people this way?

Well, the kind with a patented ergonomic design and high resolution, 400-points-per-inch tracking.

The kind of mouse that wins the *PC Magazine* Editor's Choice Award and Technical Excellence Award.

Not to mention the Innovation in America Design Award from *Business Week*, the Industrial





e, you build a bigger following.

Design Award from *Industrie Forum* and others.

And incidentally, no mouse works better with another innovation of ours, Microsoft Windows[®] graphical environment version 3.0.

To track down America's num-

ber one mouse, call (800) 541-1261, Department Q02.

We'll be happy to point you in the right direction.

Microsoft[®]
Making it all make sense[®]

CONNECTIVITY PRINTER-SHARING DEVICES

PRINTER-SHARING DEVICES: SUMMARY OF FEATURES

Products listed in ascending price order

Fifth Generation Systems Inc. The Logical Connection	Buffalo Products Inc. Buffalo SL-512	Excellink Inc. PrintPoint 6x2	Rose Electronics FastPrint 8S2U/5X	Protec Micro- systems Inc. Byteway 1000 Plus 8P1MB	Q4 Instruments Inc. Data Shuttle 8400
---	--	----------------------------------	--	---	---

GENERAL FEATURES

Serial transmission speeds	300-9,600 bps	300-115,200 bps	1,200-115,200 bps	300-115,200 bps	N/A	300-115,200 bps
Device can restrict printer access	■	■	■	□	■	■
Unit uses TSR for printer control	■	■	□	■	■	■
Size of TSR	23K	15K	N/A	10K	21K-37K	17K
TSR can be unloaded	■	■	N/A	■	□	□
Diagnostics included	■ (in hardware)	■	■ (in hardware)	■	□	□
Sends form-feed to clear printer buffer	■	■	■	■	■	■
Print jobs can be cancelled	■	■	□	■	■	■
Print job priority ratings available	□	■	□	□	□	□
Warranty	1 year	1 year	1 year	1 year	1 year	1 year

■—Editors' Choice ■—Yes □—No
N/A—Not applicable: The product does not have this feature.

does not include any cables, but the unit keeps cabling costs down by using modular four-wire telephone-style cable. If you choose to buy the cables from Excellink, prices are \$5 for 25 feet, \$8 for 50 feet, or \$14 for 100 feet. Adapters for plugging the cable into a serial port are \$10 for

ate at 9,600 bps, you can simply plug in the cables and add two MODE commands to your AUTOEXEC.BAT file: one to initialize your serial port at 9,600 bps, and one to redirect printer output to the serial port.

Two of the PrintPoint's serial ports are limited to 9,600 bps. The other four, however, can go as high as 115,200 bps. To take advantage of the higher speed on the faster ports, you need to take two additional steps. First, set the port on the PrintPoint for the higher speed. And second, set the PC port to which the device's port is connected.

The first step is easily handled by sending a command to the unit with the DOS ECHO command, much as you could send an AT command directly to a Hayes-compatible modem. The second step is a simple matter of copying Excellink's SETBAUD program to your hard disk, then adding a command to your AUTOEXEC.BAT file to run SETBAUD.

AVOIDING CONFUSION

While all this is straightforward for those who know their way around a serial port and printer, it may be confusing for those who don't. Fortunately, the PrintPoint manual does a good job of explaining each step. And if you'd rather not modify your AUTOEXEC.BAT file manually, the package comes with an install program that will do the job for you. You need only tell the program which comm

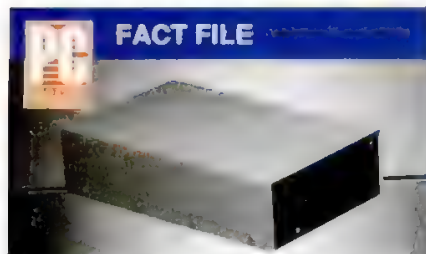
port the printer sharer is connected to; SETBAUD supports COM1 through COM4. If you need more help, Excellink also provides phone support, though not toll-free.

As already mentioned, there is no printer-control software with the package. This lack of a control program is a notable inconvenience, but sending com-

The PrintPoint offers
Spartan simplicity
and generally top-
flight test scores.

mands with DOS ECHO is easy enough, if clumsy. To select the printer on printer port 1, for example, you type "ECHO PI>COM1" (assuming the printer sharer is on COM1). If you wish, you can put the ECHO commands in batch files. You'll even find a set of batch files already on disk along with the install program and the SETBAUD utility.

For many users, the lack of control software will be balanced by the PrintPoint's performance. On PC Magazine Labs' Time to Send and Time to Print tests, the unit scored in or near the top tier



PrintPoint 6x2

Excellink Inc., 510 Valley Way, Milpitas, CA 95035; 408-946-3646.

List Price: Including 1MB RAM, six serial and two parallel ports, \$797; 25-foot four-wire telephone-style cables, \$5 each.

Requires: Cables.

In Short: Although two of the PrintPoint 6x2's six serial ports are limited to 9,600 bps, the PrintPoint is one of the better units we reviewed. The package lacks a TSR program for choosing between the two printers you can connect, but simple DOS batch files work around this limitation.

CIRCLE 424 ON READER SERVICE CARD

either the PC-style DB-25 version or the AT-style DB-9 version. The device itself offers appropriate modular connectors.

Setting up the PrintPoint is as simple as you could hope for with any serial connection. In fact, if you are willing to oper-

CONNECTIVITY PRINTER-SHARING DEVICES

units come with a one-year warranty.

The PrintPoint 6x2 and the JetCard are also available from several manufacturers in OEM versions. These include the external Maestro and internal ServerJet from ASP, the external Sprinter from Belkin Components, and the internal Local Union 62i from Laser Tools. Most of the OEM versions come with a TSR control program.

The PrintPoint is probably the wrong unit for users who are unfamiliar with concepts like batch files. For offices with heavy-duty printing needs, however, the PrintPoint's better-than-average performance makes it viable. It's a fine choice where users are sophisticated enough to write their own batch files, or where someone else is available to do the honors.



The Logical Connection

Fifth Generation Systems Inc., 10049 N. Reiger Rd., Baton Rouge, LA 70809; 800-873-4384, 504-291-7221.

List Price: Including 512K RAM, four serial and four parallel ports, 8-foot null-modem cable, \$495.00; as tested, with three 8-foot null-modem cables, two 8-foot parallel straight-through cables, \$644.70.

Requires: 23K RAM per PC, DOS 2.0 or later, cables.

In Short: Its 9,600-bps maximum rate for serial links prevents The Logical Connection from being the fastest product we reviewed. But in its favor, it has reliability, the versatility of configuring across several hardware platforms, and a bargain price.

CIRCLE 425 ON READER SERVICE CARD

IMC/Data Manager Data Manager XL-100	Consolink Super Spooler II	Digital Products Inc. PrintDirector Silver PDSSP
300-115,200 bps	300-38,400 bps	300-19,200 bps
☐	☐	☐
20K	16K	13K
☐	☐	☐
☐	(in hardware)	☐
☐	☐	☐
1 year	3 years	1 year

ENDS

overall. It also handled all the pass/fail tests without problems, although the TSR-related tests were not applicable.

One limitation for the PrintPoint is its inability to cascade units should your needs grow. If you foresee that expansion as a

The Logical Connection offers reliable PC operation with support for the Mac and other hardware platforms.

FIFTH GENERATION
SYSTEMS INC.

The Logical Connection

by Ed Parratore

Our evaluation of printer-sharing devices revealed that half the battle is fought up front, in the product's installation and configuration process. The Logical Connection, \$495 from Fifth Generation Systems Inc. for a system with 512K RAM and eight ports, glides smoothly past this challenge and offers reliable PC operation with support for the Macintosh and other hardware platforms.

The product's flat body measures 0.9 by 14.4 by 4.1 inches. It's studded with eight DB-25 ports: four serial, two parallel-input, and two parallel-output. Two LEDs signal a variety of functions and error conditions, although there's no way to tell which linked station is sending or receiving data.

Typically, Fifth Generation sells The Logical Connection with an 8-foot null-modem cable for serial connections, a utility disk, and a helpful manual. The base price for a 512K buffer is \$495.00; our version, with five cables for PC connections cost \$644.70. The 256K version costs \$395.00; Fifth Generation will upgrade the latter's memory to 512K for a surcharge. If you install memory on your own or through a dealer, as the company recommends, you can upgrade either

version for less money, even to the unit's full 1MB capacity.

If you need a different configuration than this product offers, Fifth Generation provides a few alternatives. The Logical Connection Plus (\$595) comes with a 512K buffer, software, and six ports that can act as either parallel or serial, input or output. The Logical Connection Junior (\$239) offers a 256K buffer, four serial-input and one parallel-output port. With a 512K buffer, it costs \$299. The Junior version requires no software.

FASTER SERIAL THAN RS-232

When installing The Logical Connection, you have the choice of connecting your PCs to either the serial or parallel ports, although you must use port 0 no matter what your configuration. For our setup, we connected two of our six PCs to the parallel ports.

Whichever PC is connected to the product's serial port 0 plays the special role of configuring—or reconfiguring as necessary—the device. Port 0 can act as an RS-485 communications port for faster transmission at a greater distance than RS-232 standards provide, providing connections to another The Logical Connection box located up to 4,000 feet away. Fifth Generation sells twisted-pair cabling to let you daisy-chain their devices, along with extra null-modem wiring. You can link up to 45 of The Logical Connection boxes in one network to give you a maximum of 135 serial ports, 90 parallel-input

possibility, you might look at the PrintPoint 7x2, base-price \$750, which adds an input parallel port appropriate for a seventh workstation or for cascading. The only other PrintPoint model is the \$895 PrintPoint 10x2, with ten serial ports for workstations and two parallel ports for printers. Excellink also sells a related series of printer sharers, called the JetCard, which plug into the optional I/O slot on a LaserJet II, IID, III, or IIID. The variations on the JetCard range in base price from \$495 to \$695. All Excellink

Some days you have
all the time in the world.



When the pressure is on, pour on the speed. With Hewlett-Packard's new LaserJet IIISi printer. A powerhouse that delivers at a throughput speed of 17 pages per minute.

With the LaserJet IIISi, you're up to speed the moment you give the "print" command. HP's RISC-based formatter and the PCL5 printer language, with vector graphics and on-the-fly typeface scaling, yield fast

results. This printer also represents a new standard for I/O performance with optional Network Printer Interface cards for either Ethernet or Token Ring.

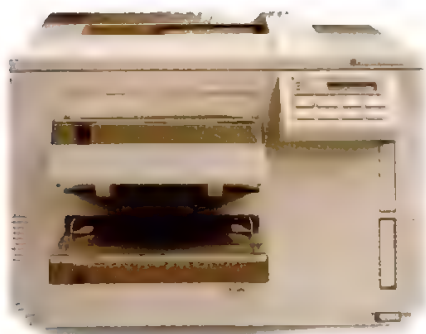
The LaserJet IIISi is specifically designed for shared-use environments. Its high-volume paper handling features include two 500-sheet input trays and a monthly duty cycle of 50,000 pages. HP offers software-selectable language switching

between PCL5 and optional Adobe® PostScript®. For added versatility, your options include

Adobe and PostScript are registered trademarks of Adobe Systems Inc. in the U.S. and other countries.



And some days you need
the new 17ppm LaserJet IIISi.



an envelope feeder and two-sided printing.

Beyond speed and efficiency, the LaserJet IIISi delivers the sharpest 300 dpi print quality yet. In fact, HP's revolutionary combination of Resolution Enhancement technology and new microfine toner challenges the print quality of many 600 dpi printers.

The price of the new LaserJet IIISi, just \$5,495*, is as impressive

as the work load it handles. If you're ready to pick up the pace, call **1-800-752-0900, Ext. 2067** for more information on the fastest LaserJet printer and the name of your nearest authorized HP dealer.



**HEWLETT
PACKARD**

CONNECTIVITY

PRINTER-SHARING DEVICES

ports, and 90 parallel-output ports. The product also allows modem links to other The Logical Connection devices.

You can set up the device's POPLC utility to run as a 23K TSR or in nonresident mode. First, however, you must run LCSETUP from the PC, dumb terminal, or emulator that is connected to port 0. LCSETUP lets you tell the device what's connected where and configure the ports' baud rate, parity, and other parameters. You can set up a station to print to one particular printer each time or give it

switchable status.

The LCSETUP interface may not impress you if looks are important, and you'll probably need to consult the manual for help on a few screens. But the program does quickly take you through the required steps with ease. Once you've uploaded your setup to The Logical Connection, copied the CONFIG.LC file to your PC stations, and modified their AUTOEXEC.BAT files

(if desired), POPLC takes it from there.

Pressing Alt-L or a chosen alternative pops up the program from within your application. You then highlight the printer to which you'd like to send your file, hit the Enter key, and print your file—it's that simple. We found no hitches in printing our PostScript files, nor in sending big files simultaneously from all six PCs.

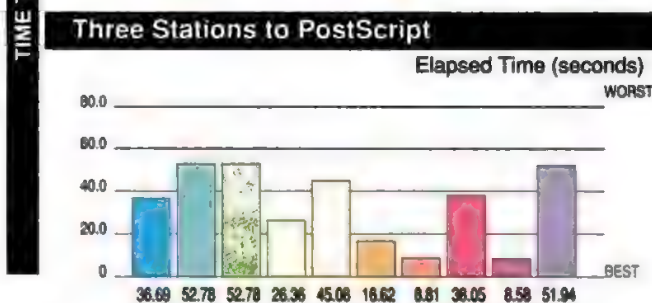
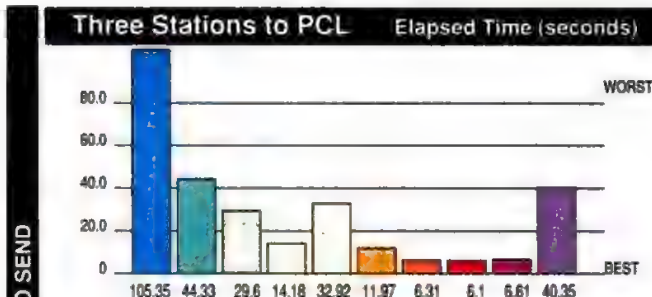
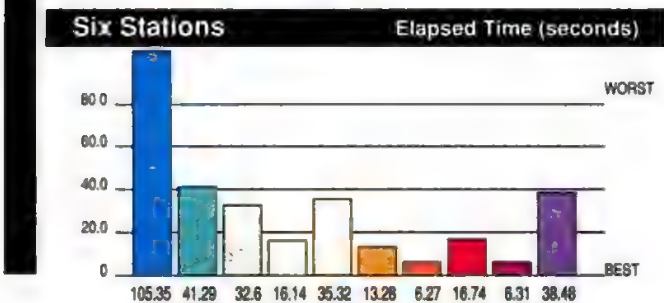
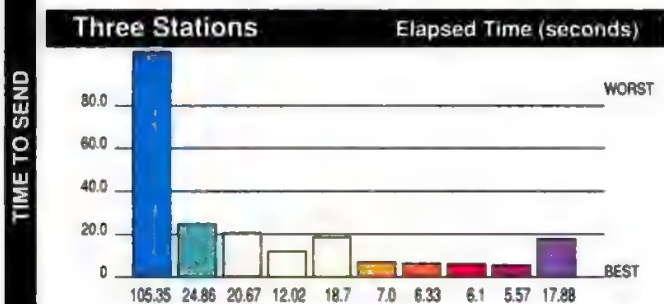
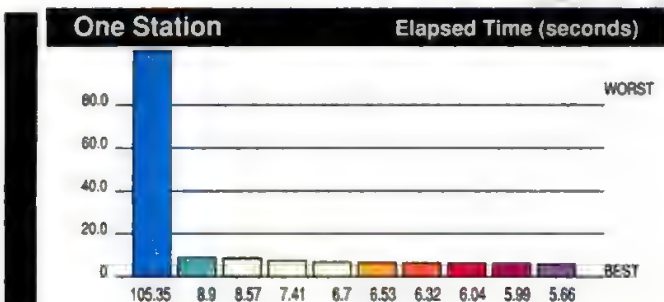
On our *Microsoft Windows 3.0*-equipped station, POPLC could only pop up from within a DOS window; from there it ran fine. One problem came up

PERFORMANCE TESTS: PRINTER-SHARING DEVICES

There is an important difference between how quickly a printer-sharing device can accept a job from the PC and how quickly it can manage the overall task of printing.

Our tests show that good performance in one of these tasks does not necessarily mean good performance in the other. Moreover, parallel connections between the PC and printer-sharing device do not automatically yield better performance than serial connections.

For the *Time to Send* test, we measured the amount of time it took to transmit the print job from each PC to the printer-sharing device and averaged the results for all PCs printing to a given printer in the test. Timing began when the test program started to send the print stream to the printer port and stopped when control returned to the program.



* Products tested with mixed parallel and serial connections between the PCs and the printer-sharing device.

CONNECTIVITY

PRINTER-SHARING DEVICES

when we invoked the program from another station, this one running *Microsoft Word* in graphics mode. The pop-up worked as usual but left holes in the screen display upon returning to *Microsoft Word*—not irreparable damage, but annoying nonetheless. *DESQview 386* and *Software Carousel* gave us no problems during testing.

JUST SEND A STRING

POPLC itself is limited to recognizing two COM and two LPT numbers. If you

don't want to use POPLC, The Logical Connection can accommodate you all the same. The reason? POPLC in essence only sends a user-specified string to The Logical Connection. The device in turn directs subsequent output from the station to the chosen printer. If you want to reset the printer, you can send another string, and you can set it to spit out a page before a print job.

If you wish to copy to your I/O port an

ASCII file that contains only the eight-character setup string, or your application permits you to embed the string in a file, then you'll never need to run POPLC once you've installed and configured The Logical Connection.

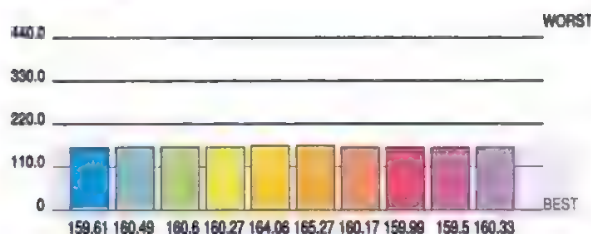
While the unit did well on our print tests, its transmission speeds fell short compared with some others reviewed. This may be due to The Logical Connection's 9,600-bps maximum serial speed.

Speed, however, is only one part of the picture; reliability and versatility com-

For the **Time to Print** test, we measured the time it took for the completed print job from each station to come out of the shared laser printer or printers, and we averaged the results for all print jobs for that printer. Timing started when the test program first attempted to send the print stream to the printer sharer and stopped when the last page of the print job dropped from the printer.

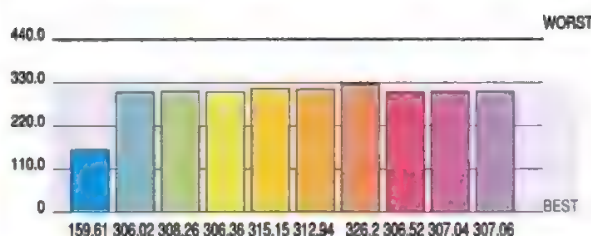
One Station

Elapsed Time (seconds)



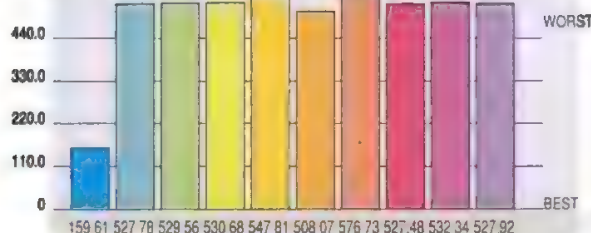
Three Stations

Elapsed Time (seconds)



Six Stations

Elapsed Time (seconds)



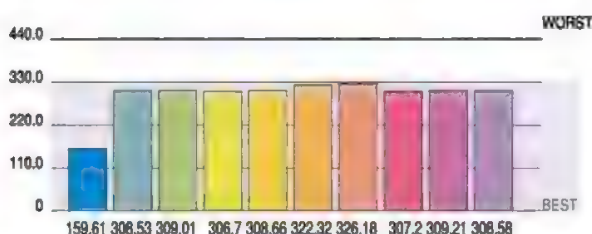
Each unit was tested with six Compaq 386-25e computers and two Hewlett-Packard LaserJet III printers. One printer was set to use its native PCL command set; the other used the HP PostScript cartridge. In each case, both printers were connected to the devices through their parallel ports. Connections from the computers to the printer-sharing device varied as required by the unit being tested, but where possible we used parallel connections for the PCs rather than serial. For serial connections, we set the PCs for the highest baud rate the printer-sharing device could support on that port.

We tested the nine printer-sharing devices with a self-timing performance test running independently on each PC. Before starting the print job, the test program first loaded a two-page document (approximately 3,100 bytes of data) into the PC's memory, a step designed to eliminate disk access time as a possible variable. It then sent the document ten times. By specifying a simultaneous start time for all PCs in the test, we were able to guarantee maximum contention for the printer resources.

Each printer-sharing device was tested using one, three, and six PCs printing simultaneously to the PCL printer, and with three PCs printing simultaneously to each of the two printers. For comparison, we also tested a single PC connected directly to a single printer using a parallel cable in both PCL and Postscript modes.

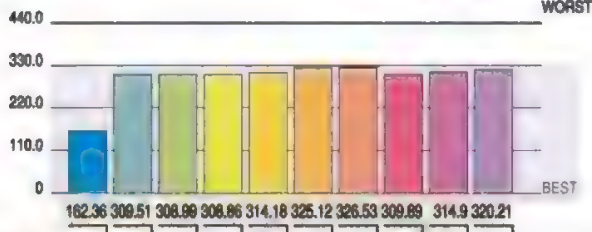
Time to Print to PCL

Elapsed Time (seconds)



Three Stations to PostScript

Elapsed Time (seconds)



CONTINUES



ZEOS 386SX

**The Incredible ZEOS 386SX
Editor's Choice System.
Loaded as you like it!
Complete 16MHz ZEOS 386SX.
ONLY \$2295.
20MHz add only \$300.**

It's what everyone wants. Our Editor's Choice 386SX system loaded with features. Now Available in 20MHz! Both loaded with savings and ready to ship to you today!

- Genuine Intel® 80386SX-16 CPU, 8/16MHz; or Intel 80386SX-20 CPU, 8/20MHz.
- 2MB of Zero-Wait DRAM, expandable to a System Total of 16MB.
- 85MB High Speed IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppies.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit VGA 1024 color graphics card with 512K RAM!
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse.
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port.
- 6-16, 2-8 bit expansion slots. 80387SX math coprocessor support.
- Rugged ZEOS SuperCase with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 200 Watt power supply for your future expansion!
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

Computers Now! SM

RIGHT NOW. GUARANTEED!*

Yes, we can ship your new ZEOS '386 today! We've built up an extra supply of the hottest selling computers in America—the ZEOS 386SX-16 and 20MHz *plus* the ultra-fast ZEOS 386DX-25 and 33MHz thunderbolts. Hot systems *ready now!*

Take your pick! All four of these '386 Color VGA screamers come packing a high capacity high speed hard drive, tons of memory, two floppies *plus* all the other goodies. And they're ready to ship. *Right Now!*

Here's how it works. We have these incredible ZEOS '386 Color VGA systems pre-built and ready to ship. While supplies last, we will ship any of these systems to you *the day you order* subject to these conditions:

1. Your order must be received by 1PM Central Time.
 2. Credit Cards are subject to authorization.
 3. Orders must be for ZEOS '386 systems configured as shown here.
- Any other systems or upgrades are custom built and will take slightly longer.

***OUR GUARANTEE TO YOU:**

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it at *our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems remain in stock; please give us a call to verify availability. This offer does not apply to other ZEOS systems or custom configurations.

IMMEDIATE SHIPMENT IS ONLY PART OF THE STORY.

These are not just any '386 systems. They're high performance, high quality ZEOS '386 systems. Packing all the ZEOS '386 value that has won PC Magazine Editor's Choice—*five times!*

But the real winner is you! Compare price, performance, quality and features. You'll see why PC Magazine selected ZEOS '386 systems "For Overall Excellence" above all others. But don't stop there.

How about *24 Hour A Day Toll Free Technical Support*. It was ZEOS who invented 24 Hour a Day Toll Free Support (it's an idea others have since copied but haven't matched). Add to it our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty, Express Replacement Parts Policy and Customer Satisfaction Package. You'll love it all. Almost as much as your new system.

So give us a call right now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today! Call now Toll Free 800-423-5891.

Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations: 386 and 386SX of Intel Corporation; Microsoft, MS-DOS and Windows of Microsoft Corporation; IBM and PS/2 of IBM Corporation; ZEOS, Computers Now!, SpaceSaver, SuperCase and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company, NASDAQ symbol: ZEOS



ZEOS 386-25

**Complete 25MHz ZEOS '386.
64K Cache, 4MB RAM, 130MB
Drive, 1024 VGA Color and
more!**

ONLY \$3195.

Power packed and ready to go! Order it UPS Red and this 25MHz Racer can be on your desk tomorrow!

- Genuine Intel® 80386-25 CPU, 8/25MHz Dual Speed Keyboard Selectable.
- Ultra high speed Zero-Wait 64K SRAM Cache. Vastly superior to page/interleave memory schemes.
- 4MB of High Speed DRAM, expandable to a System Total of 16MB.
- Ultra Fast 130MB IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppy drives.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit VGA 1024 color graphics card with 512K RAM!
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O Card with two Serial, one Parallel & one Game Port.
- 1-32, 6-16, 1-8 bit expansion slots. 80387 and Weitek math coprocessor support.
- Rugged 5-bay ZEOS case with 300 Watt power supply for increased system expandability.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.



ZEOS 386-33

**Loaded ZEOS '386 33MHz
Screamer. 128K Cache, 4MB
RAM, 130MB Drive, 1024 VGA
Color and more.**

ONLY \$3695.

Government Computer News calls it "Arguably the fastest MS-DOS and OS/2 micro in the world." Your 33MHz '386 Screamer in our 8-bay Vertical case!

- Genuine Intel® 80386-33 CPU, 8/33MHz Dual Speed Keyboard Selectable.
- Ultra high speed Zero-Wait 128K SRAM Cache.
- 4MB of Zero-Wait DRAM, expandable to a whopping 32MB on the motherboard.
- 130MB High Speed IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppy drives.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit VGA 1024 color graphics card with 512K RAM!
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O Card with two Serial, one Parallel & one Game Port.
- 2-32, 6-16 bit expansion slots. 80387 and Weitek math coprocessor support.
- Rugged ZEOS 8-bay vertical case with 300 Watt power supply for maximum expandability.
- Two cooling fans for added reliability and increased component life.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

**ZEOS. Fast
Delivery, Great
Systems! A Few
Expert Opinions:**

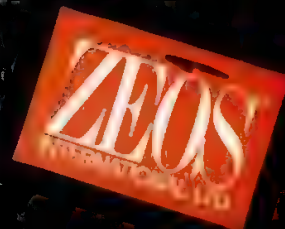
■ **PC Magazine,**
On the ZEOS
386SX, "With so
much going for it,
how could you
go wrong?"

■ **PC Magazine,**
On ZEOS '386
systems, "Out of
104 Machines...
For Overall
Excellence we
selected ZEOS
International..."

■ **PC Magazine,**
On Zeos '386
Speed, "The ZEOS
blows away every
other computer...
a smart choice."

ORDER NOW TOLL FREE
800-423-5891

FAX Orders: 612-633-1325
Minnesota: 612-633-4591
Hearing Impaired:
800-228-5389
Outside US and Canada:
612-633-6131
MasterCard, VISA,
Discover, Am Exp, Z-Card
and COD.
Open 24 Hours a Day,
365 Days a year!



PERFORMANCE TESTS: PRINTER-SHARING DEVICES



The single-PC-to-single-printer setup provided the slowest scores on the Time to Send tests, confirming the advantage of having the print job buffered by the printer sharer. It also provided a comparison for seeing how much the average print job for any given printer sharer is slowed down by contention for printer resources.

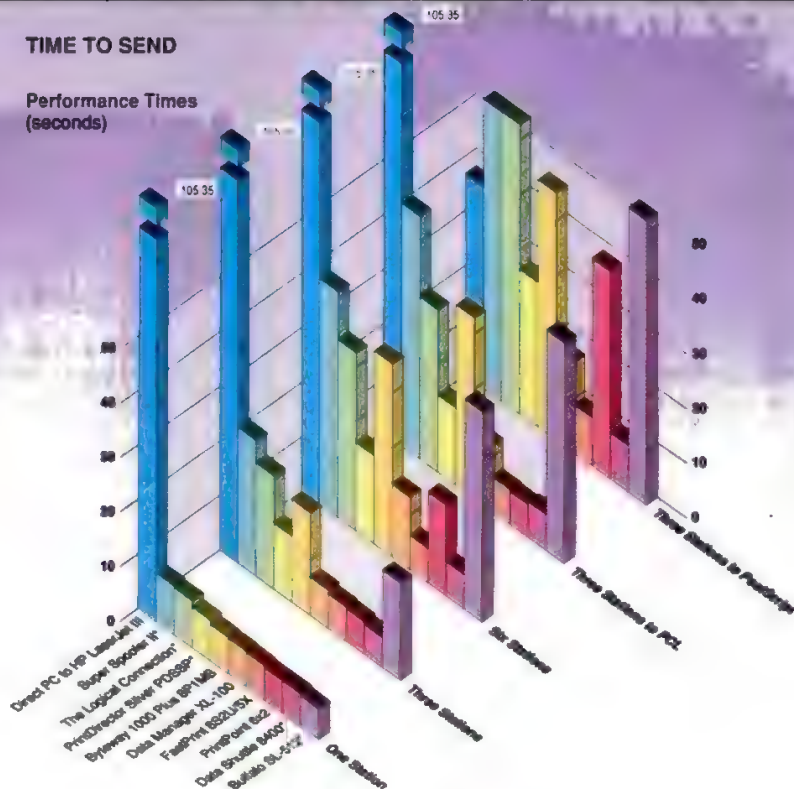
Overall, our tests yielded two noteworthy results. The first is that parallel connections between the PC and printer-sharing device do not automatically yield better performance than serial connections. Of the nine units we tested, only Protec's Byteway 1000 Plus 8P1MB provided six parallel ports for the PCs, and its overall performance was convincingly lower than average. Less surprising was that top performance on the Time to Send tests was not always coupled with top performance on the Time to Print tests.

Taking both sets of tests into account, Q4 Instruments' Data Shuttle 8400, Excellink's PrintPoint 6x2, and Digital Products' PrintDirector Silver PDSSP performed the best overall. This does not mean that each one is the best performer in each category.

On the Time to Send tests, the clear winners were the Data Shuttle and Rose Electronics' FastPrint 8S2U/5X, followed closely by the PrintPoint. The PrintDirector Silver did better than most but was somewhat below the first tier, largely because of its maximum setting of 19,200 bps for its four serial connections to the PCs. On the Time to Print tests, the FastPrint was less impressive, ranking as the slowest on four of the five tests. At the same time, the Data Shuttle and the PrintPoint were matched or slightly better by four other units. Of these four, the PrintDirector Silver was the only one that also yielded midrange or better performance on the Time to Send tests.

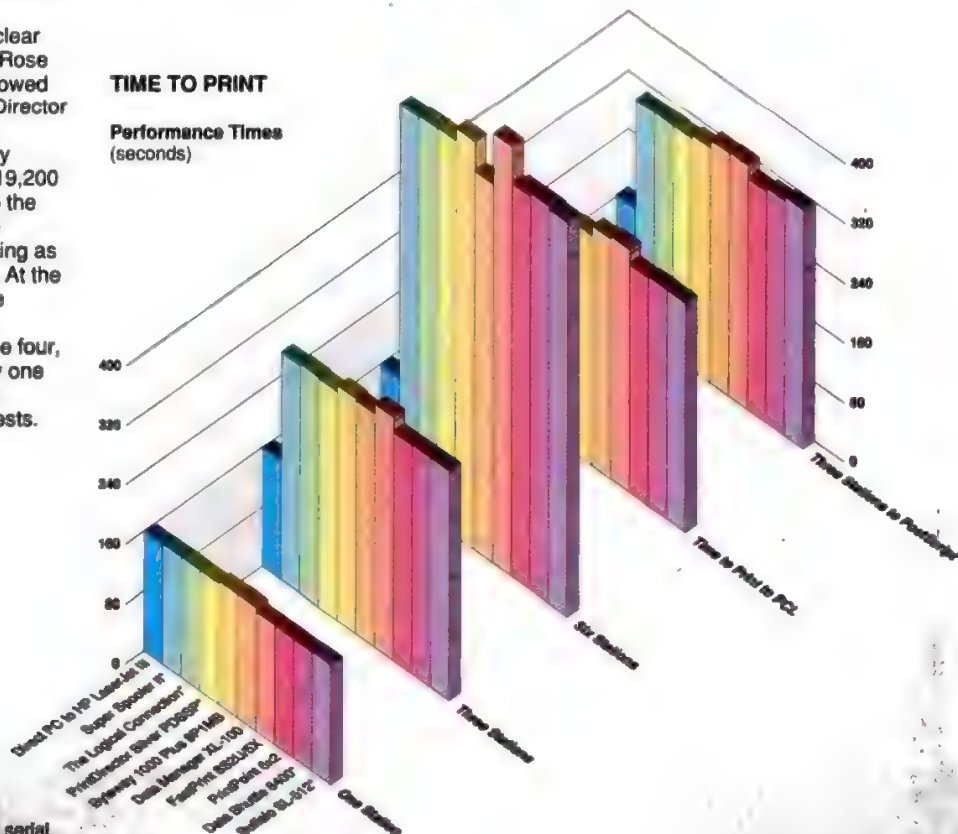
TIME TO SEND

Performance Times (seconds)



TIME TO PRINT

Performance Times (seconds)



* Products tested with mixed parallel and serial connections between the PCs and the printer-sharing device.

ENDS

The Windows Experts

Consistent low prices and product availability

Windows Software

Adobe Systems Inc.			
Illustrator Windows 1.0	278	Informix	
Adobe Type Manager 1.0	54	Win2 For Windows	306
Adobe Type Set 1 or 2	55	Hewlett Packard	
Adobe Type Set 3	118	HP New Wave	104
ATM Windows Plus Package	108	Microsoft Corporation	
Aldus Corp.		Office for Windows	605
Aldus PageMaker 3.01	494	Windows 3.0	87
Aristocad		Word For Windows 1.1	304
More Windows 1.0	54	PowerPoint For Windows	304
Asymetrix Corp.		Windows 3.0 Software	
Toolbook For Windows	284	Dev Kit	324
Bell Atlantic Corp.		Windows Entertainment Pack	28
ThinX	289	Excel 3.0 For Windows	298
Caere Corporation		MultiSoft	
OmniPage 386 V3.0	598	PC Kwik Powerpak 2.0	68
Corel Systems		Micrografix	
Corel Draw! 2.0	365	Charisma For Windows	319
hDC Computer			
Windows Express	50		
First Apps For Windows	47		
Delrina Technology			
PerformPro For Windows	262		
Crosstalk Communications			
Crosstalk For Windows	128		
Foresight Resources			
DraftX Cad For Windows	406		
FormWorx Corporation			
Form Publisher 1.21	134		



Numbers & Co. Whiskers

Increase the use of your mouse, by letting the right and/or middle mouse buttons emulate any key of the keyboard. Assign Copy, Cut, or Paste commands to buttons or even activate the Task Manager with a single click.

Whiskers\$19

FREE WITH ANY WINDOWS PURCHASE
LIMITED TO STOCK ON HAND.

ThreadZ Software Design GroupFileF/X

FileF/X is a nimble alternative to the Windows Program Manager. Use it to launch applications, arrange windows, and maneuver effortlessly between tasks. Add your favorite applications and other utilities to a Task Manager menu. Plus you get a unique collection of Window tools like File Find, File Undelete, Text Search and more.

FileF/X\$74



Dariana WinSleuth or SystemSleuth

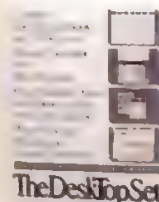
Let WinSleuth resolve system conflicts in the Windows 3 environment or let SystemSleuth find conflicts in your hardware configuration.

WinSleuth or SystemSleuth\$78

DeskTop Set

The DeskTop Set personal and business organizer combines essential programs into a powerful, flexible and easy-to-use system featuring calendar, appointment book and "to-do lists". A Programmable dialer with phone log and area code directory and phone book with business and personal databases makes this a valuable addition to any desktop.

DeskTop Set\$79



Above Software			
Above Disk 4.0	54	Funk Software	
American MegaTrends Inc.		Always 1.0	104
Amidiag	51	PD Queue	51
Berkeley Geoworks		Gibson Research	
Geoworks Ensemble	119	SpinRite II V1.1	64
Brøderbund		Helix	
MemoryMate 3.02	38	Headroom 2.0	66
Prompt 1.0 - Access Softek	73	Netroom 1.1 4 User	87
Dragnet 1.0 - Access Softek	78	Magee	
Central Point Software		Auto Menu 4.7	32
PC Tools Deluxe 6.0	84	MicroCom	
Copy II PC 6.0	24	Virex PC	69
Central Point Backup	56	Ontrack	
Custom Applications		Disk Manager Dos 4.2	48
Freedom Of Press	238	Personics	
Freedom Of Press Lite	60	Ultravision 2.0 For Ega	
Digital Research		Or Vga	78
Dr. Dos 5.0	134	Quarterdeck Office Systems	
Delta Technology		Desqview 2.3	75
Direct Net	144	Qualitas	
Fifth Generation		Blue Max 5.1	75
Mace Utilities 1990	88	Prime Solutions	
Fastback Plus 2.1 for the PC	108	Disk Technician Adv 6.0	90

Font Dances

9600 Baud, Inc.	
Maxx Yoke Joystick	79
Maxx Pedals Joystick	55
Logitech	
Logitech Mouse	73
Trackman TrackBall (Serial)	85
Logitech Mouse	
W/ Windows	138
Microsoft Corporation	
Mouse (Bus Ser)	88
Mouse W Windows 3.0	144
Serial Mouse	89
Mouse Systems	
Omni Mouse II Bus Version	54
PC Mouse III Bus Version	89
TrackBall Mouse Bus Version	65
Z-Nix	
Super Mouse II	
W/ Windows 3.0	95

25 Plus/Charisma

No more downloading fonts or switching cartridges! Add additional fonts, letterhead, signatures and forms by simply plugging in modules. The 25 Plus/Charisma is compatible with all HP printers and works with all leading software.

25 Plus Charisma\$275
Additional Fonts\$75



Progressive Computer Services EZ-Menu

EZ-Menu, the easiest and most powerful computer organizer provides you with a complete listing of all available options when you turn on your computer. Selecting an option takes you instantly into that application.

EZ-Menu\$39

Adobe Systems

Adobe Postscript Cartridge	238
Adobe Type Cartridge 1 or 2	228
Font 6 Optima	123
Font 9 ITC Garamond	123
Font 11 Bengt & Fritz Quad	123
Font 13 Helvetica Lt & Black	123
Font 17 Galtard	123
Font 19 Korinna	123
Font 20 Goudy Old Style	123
Font 21 Sonata	61
Font 24 Cheltenham	123
Font 26 Bodoni	123
Font 31 ITC Tiffany	180
Font 39 Futura 1	154
Font 46 Futura 2	153
Font 58 OCR-a OCR-b Micr	93
Font 63 Kaufman	93
Font 94 Linoscript & Linotext	93
Font 96 Akzidenz Grotesk	123
Font 98 Bauer Bodoni	123
Font 100 Adobe Garamond	175
Font 101 Adobe Gar. Expert	123
Font 109 Minstrel Reporter	93
Font 110 Nuptial	
Cascade/Medici	93

Font 115 Kunstler Script	93
Font 116 Industria	123
Font 123 Tekton	93
Font 130 Eurostile Ext & Cond	123
Font 136 Shelley Script	93
Font 142 ITC Century Cond	225
Font 152 Gal Sans	175
Font 161 Bembo	123
Font 162 Gal Sans 2	123
Font 170 ITC Cushing	243
Font 171 Cheq	35
Font 172 Sasoon Primary	65
Font 173 ITC Fenice	243

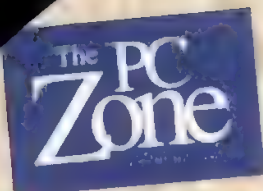
Elite Business Apps	
25 Plus Charisma Font Cart	275
Add'l Font	99

Storax Media

Maxell	
5 25" HD Disks	20
5 25 DD Disks	10
3 5 HD Disks	26
3 5 DD Disks	15

We carry the entire Maxell Data Line. Call for prices.

CALL NOW • 1-800-258-8088 • THE PC ZONE



Over 800 best-sellers in stock

Call for our complete product listings

Education

Software ToolWorks	
World Atlas	34
Individual Software	
Professor Windows	26
Penton Overseas	
French, German, Hebrew, Russian, Spanish, Italian, Japanese (level I or II)	38
Learning Company	
Reader Rabbit	24
Writer Rabbit	26
Outnumbered	32
True Basic	
Algebra 4.0 + Workbook	48
Calculus 4.0 + Workbook	48
Pre Calculus 4.0 + Workbook	48



Systems Compatibility

Outside In or Software Bridge

With Outside In you create new documents by importing text or data from your word processor, spread sheet, or database files without leaving your word processor. Software Bridge's document conversions allow you to edit or print documents created with a word processor different than your own.

Outside In	\$57
Software Bridge	\$71

MySoftware My Business Checkbook or MyInvoices

MyBusiness Checkbook is a powerful expense management and check writing utility. MyInvoices is a product designed to simplify your billing and cash collection.

MyBusiness Checkbook	\$25
MyInvoices	\$15



WordPerfect, Inc. LetterPerfect

Whether you type with two fingers or ten, LetterPerfect® gives you basic word processing features for your memos, letters, and reports. LetterPerfect is perfect for battery-powered laptop computers.

LetterPerfect	\$115
----------------------------	-------



Business & Professional

Ashton Tate		FormWorx Corporation		Micrologic		PC Globe, Inc.		Symantec	
Dbase IV 1.1	478	FormWorx With Fill & File 2.5	81	Info Select	52	PC Globe 4.0	34	Q&A 3.0	215
Avery Labels		Fox Software		More Fonts	95	PC USA 2.0	34	TimeSlips	
Avery Labelpro	43	Foxbase+ Developer System 2.1	195	MicroRim		Rightsoft		TimeSlips III 4.0	168
Bloc Publishing		Fox Professional	428	R BASE Personal	69	Rightwriter 4.0	52	Timeworks	
Personal Lawyer	33	Funk Software		R BASE 3.1 Single User	465	Microsoft Corporation		Publish It! Lite	32
Form Tool Gold 3.0	52	Sideways 3.3	55	Monogram		Works 2.0 For The PC	91	Publish It! 1.2	131
Borland International		Individual Software		Dollars And Sense 3.1	94	Word 5.5 For PC	208	Wolfram Research	
Paradox 3.5	498	Resume Maker 1.1	28	Nantucket Corporation		Software Publishing		Mathematica 386	669
Quattro Pro 2.0	309	Lotus Corp.		Clipper 5.0	449	Pls First Publisher 3.0	83	WordPerfect Corporation	
Bruderbund		Lotus 1-2-3 Rel 3.1	408	Nolo Press		Pls First Choice 3.02	91	WordPerfect 5.1	244
BannerMania	18	Agenda 2.0	288	Willmaker 4.0 For The PC	33	Professional Write 2.2	168	WordPerfect Office 3.0	79
Buttonware		Meca Ventures		Olduvai		Harvard Project Mgr 3.01	404		
PC File 5.0	75	Home Lawyer 1.0	63	Read-it OCR Personal For PC	145				
Ce Software		Merrill & Bryan		Patton & Patton Software					
PC QuickMail		Turbo Ems	55	Flow Charting III	138				
Single User V2.2	58	MySoftware		PC Publishing					
Chronologic Corp.		MyLabelmaker For PC	15	Impress 2.0	70				
Instant Recall 1.2	58	MyPhonebook For PC	9	Reference Software					
Chronos Software		MyCheckbook For PC	15	Grammatik IV 1.0 For The PC	48				
Who What When 2.0	162	MyMailList For PC	15	Passport Designs					
Contact Software Int'l		Power Up		Master Tracks Pro For PC	395				
Act! 2.01	206	Calendar Creator Plus	38	Encore! For The PC	495				
Delta Technology		Top Priority	52						
Direct Access 5.0	78								

Database

Borland International	
Turbo C++ Professional 1.0	192
Turbo Pascal Professional 6.0	188
Digital	
SmallTalk V 286 1.1	118
SmallTalk V 2.0	58
Harvard Associates	
PC Logo 3.0	58
Microsoft Corporation	
Basic Prof. Dev. System 7.1	298
C Compiler 6.0	306
Macro Assembler 5.1	91
Multiscope	
Multiscope Debugger For Dos	125
True Basic	
True Basic 2.1	51

PC Globe 4.0

PC Globe 4.0 is an enhanced "electronic atlas" and an indispensable resource tool. Detailed maps, graphics, facts and figures, instant profiles of 190 countries and dependencies are available in a single, simple-to-use source.

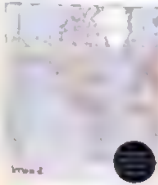
PC Globe 4.0	\$34
---------------------------	------

Buttonware PC-File 5.0

You don't have to be a computer programmer to use this friendly database manager. The simple menu system and context-sensitive on-line help let you get the jobs done quickly and easily. Includes addresses, filing, lists and inventory procedures.

PC-File 5.0	\$75
--------------------------	------

PC Globe



Graphics and Design

American Small Business Co.		Generic		Micrografz	
Design Cad 3D V 4.0	187	Generic Cad 3D Drafting	198	Designer 3.0	454
Application Techniques		Generic Cad 5.0	224	Software Publishing	
Pizzazz Plus	64	Bruderbund		Harvard Graphics 2.3	294
Autodesk, Inc.		New Print Shop For The PC	34	Xerox	
Autodesk Animator	238	New Print Shop Companion	28	Gray F/X	304
Autosketch 3.0	140	Insel Systems		WordPerfect Corp.	
Computereasy Software		Hijaak 2.0	120	DrawPerfect	262
Dream House Professional	37	Lotus Corp.			
Floor Plan	23	Freelance Plus 3.01	310		

- We accept Visa, MasterCard, Discover, American Express, and wire transfer
- Your credit card will not be charged until order ships
- PO's accepted subject to credit approval
- No sales tax (except WA residents 8.2%)
- We reserve the right to limit quantities
- Prices, terms, and product availability subject to change without notice
- All products covered by a 120 day limited warranty in addition to manufacturer's warranty. Defective software replaced immediately. Hardware replaced or repaired at our discretion.
- Airborne Express overnight delivery add \$6 per order (up to 7 lbs. add \$1 each additional pound). Alaska and Hawaii included.
- UPS Ground shipping \$3 in continental US
- International orders pay actual shipping and handling
- Orders placed by 9:00pm Eastern Time / 6:00pm Pacific Time (weekdays) for "in stock" items, ship same day (barring system failure, etc.)

18005 NE 68th Street, Suite A110, Redmond, WA 98052
Outside U.S. (206) 883-3088 • Fax (206) 881-3421

CALL NOW • 1-800-258-8088 • THE PC ZONE



PASS/FAIL TESTS: PRINTER-SHARING DEVICES

Once installed, a printer-sharing device should let users ignore it, except when they're selecting a different printer. These pass/fail performance tests judge how well a package meets that goal.

All the printer-sharing devices we tested could successfully print graphics and heavily formatted text on both PCL and PostScript printers, and all worked with our selection of print-management and print-spooling schemes. Some units wouldn't let us conveniently change printer selections from within a program, and one could not accept all six pass/fail print jobs at once.

Only three units handled all the pass/fail tests without any problems: the \$1,095 PrintDirector Silver PDSSP from Digital Products, the \$895 Byteway 1000 Plus 8P1MB from Protec Microsystems, and the \$660 Buffalo SL-512 from Buffalo Products. While these are not the only packages to provide a TSR as an option for changing printer selection, they are the only ones with TSRs that worked with DOS 4.01 and that could handle graphics screens acceptably. Excellink's PointPoint 6x2 didn't fail any tests, but it lacks the convenience of a TSR.

The **Windows Output and Compatibility** test assesses the device's ability to handle heavily formatted text on a PostScript printer and to work with the *Microsoft Windows 3.0* print spooler. The formatted text was created with *Microsoft Word* for Windows and printed from the same program.

The **Software Carousel Compatibility** test determines whether the unit can work with *Software Carousel's* print spooler. For this test, the print job was an ASCII text file sent to the PCL printer. An N/A result means the unit does not connect to PCs through a parallel port, the only kind of connection the spooler supports.

The **DESQview Compatibility** test determines the ability of the printer-sharing device to work with *DESQview 386's* print-management feature. The print job for this test was an ASCII text

file sent to the PCL printer.

The **SideKick Compatibility** test evaluates whether the unit's TSR program, if there is one, can coexist with *SideKick*. The print job for this test was an ASCII text file sent to the PCL printer. An N/A means either that the unit does not include a TSR program or that the program does not work in DOS 4.01.

The **PCL Text Output** test shows whether the unit can work with a heavily formatted text file going to the PCL printer. For this test, the print job was a *WordPerfect* text file created in *WordPerfect* and printed from the same program.

The **PostScript Graphics Output** test determines whether the unit can handle a large (over 700K) PostScript graphics file. The print job for this test was a graphics image printed to disk and copied to the printer using the DOS COPY command.

The **Six Concurrent Jobs** test assesses the printer-sharing device's ability to handle the load of six computers printing at once—including some with large print jobs. The test consisted of simultaneously printing all six print jobs already described.

The **PCL Graphics** test determines whether the unit can successfully send graphics to a PCL printer. The print job for this test was a graphics image printed to disk as a 500K file and sent to the printer-sharing device from the disk.

The **TSR with Graphics** test evaluates whether the TSR program, if there is one, can pop up over a graphics screen, let the user select a printer, and then successfully restore the screen. For this test, we used *Microsoft Word* running in graphics mode. An N/A on this test means either that the unit does not include a TSR program or that the TSR program does not work in DOS 4.01.

Windows Output and Compatibility

Software Carousel Compatibility

DESQview Compatibility

SideKick Compatibility

PCL Text Output

PostScript Graphics Output

Six Concurrent Jobs

PCL Graphics

TSR with Graphics

P — Pass
R — Fail
N/A — Not applicable

	Buffalo SL-512	Super Spooler II	PrintDirector Silver PDSSP	PrintPoint 6x2	The Logical Connection	Data Manager XL-100	Byteway 1000 Plus 8P1MB	Data Shuttle 8400	PrintPrint 8520/5X
Windows Output and Compatibility	P	P	P	P	P	P	P	P	P
Software Carousel Compatibility	P	P	P	N/A	P	N/A	P	P	N/A
DESQview Compatibility	P	P	P	P	P	P	P	P	P
SideKick Compatibility	P	P	P	N/A	P	N/A	P	P	P
PCL Text Output	P	P	P	P	P	P	P	P	P
PostScript Graphics Output	P	P	P	P	P	P	P	P	P
Six Concurrent Jobs	P	P	P	P	P	P	P	P	P
PCL Graphics	P	P	P	P	P	P	P	P	P
TSR with Graphics	P	R	P	N/A	R	N/A	P	R	R

HOW WE TESTED

Each unit was tested with six Compaq 386-25e computers and two Hewlett-Packard LaserJet III printers. One printer was set to use its native PCL command set; the other used the HP PostScript cartridge. In each case, both printers were connected through their parallel ports. Connections for the computers varied as required by the unit being tested.

We printed a selection of samples that included straight ASCII text, graphics, and heavily formatted text, with some print jobs going to the PCL

printer and others to the PostScript printer. We first tried printing six jobs simultaneously to confirm that the printer-sharing device could handle a maximum load. If the six jobs didn't all print, we then tried to print individually any job that had failed. The seventh print job, the PCL graphic, was always printed separately. For those packages with a TSR program to allow easy change of printer selection, we loaded the program before running this last test.

pose the rest. These, coupled with the product's one-year warranty, technical support line, and both CompuServe and BBS support, make *The Logical Connection* a hard choice to pass up.

IMC/DATA MANAGER
Data Manager
XL-100
by Greg Pastrick

In terms of fast setup, direct status checking, low maintenance, and nearly effortless troubleshooting, the \$995 Data Manager XL-100 with 512K buffer, eight serial

CONNECTIVITY

PRINTER-SHARING DEVICES



Data Manager XL-100

IMC/Data Manager, 1380 Bordeaux Dr., Sunnyvale, CA 94089; 800-537-5999, 408-744-9004.

List Price: Including 1MB RAM, eight serial and two parallel ports, \$995.00; as tested, with five 10-foot six-wire telephone-style cables, one 100-foot six-wire telephone-style cable, six adapters, \$1,074.20.

Requires: 20K RAM per PC, DOS 2.0 or later, cables.

In Short: A printer-sharing device that's effortless to install, maintain, and troubleshoot. There's little excuse for the current version of the TSR not working with DOS 4.0, but the memory-resident utility is not necessary to run the package. Once the software catches up, the XL-100 will be even more versatile than it is now.

CIRCLE 426 ON READER SERVICE CARD

ports with RJ-11 connections, two DB-25 parallel ports, and one Ethernet port is a PC resource person's dream machine. The Ethernet port allows the user to connect an Ethernet network of up to 16 PCs to the Data Manager to share its attached printers. Configured for our tests, with six serial cables for PC connections, the system's price totaled \$1,074.20.

The 5-pound 12- by 6- by 7-inch printer-sharing device features a direct-access, four-key control panel with a 16-character LCD that configures and controls all port operations through multi-level menus. From the control panel there are three top-level menu selections: Setup, Job, and Status. The Data Manager's Setup menu offers three options: Standard, Advanced, and Ethernet. Call up the Advanced menu and you have access to the complete list of configuration parameters for each of the unit's ports, including input/output selection, transmission rates, stop bit settings, timeouts, and handshaking.

Options in all menus are selected and entered using the plus, minus, and enter

keys on the panel. The Jobs menu displays the status of print jobs queued and printing. The Status menu displays the printer configurations and output-destination selections for assigned ports—it's that straightforward. Best of all, documenting the system setup is as simple as cycling through the menu to the appropriate point and printing a configuration report. The LCD constantly monitors the changes in memory as files move in and out of the buffer on to their destinations.

IMC supplies a 30K pop-up, called IMCDOS, that is useful for sending commands to printers and devices attached to the Data Manager, but the TSR unfortunately doesn't operate under DOS 4.0. (IMC is updating IMCDOS—the revised version was not available for review.) The only software you need for using the Data Manager on a standard DOS platform, however, is a 20K utility called COMSET; it supports all transmission speeds from 9,600 bps to 115,200 bps, by way of character-switch combinations. For example the command "COMSET 1 1," entered into the AUTOEXEC.BAT, sets the PC to support data transmission at 115,200 bps.



Wait a minute.

The long modem wait is over. Announcing the arrival of our remarkably quick 9600EX modem.

So how quick is quick? With V.42bis, data can be compressed up to 400 percent, increasing throughput to as much as 38.4Kbps. Which means it keeps its telephone conversations short and saves you money on your phone bills. And while it communicates

quickly, it also communicates clearly. The 9600EX knows when data is being garbled and automatically retransmits, so your data arrives error free.

Plus, the 9600EX features full-compliance with V.32 and is downward-compatible with slower modems. And, like our entire family of modems, the 9600EX comes with a full, five-year warranty.

CONNECTIVITY
PRINTER-SHARING DEVICES

The Data Manager generally turned in exceptional scores on the Time to Send test but was not nearly as impressive on the Time to Print test. In addition, the Data Manager failed to manage the simultaneous printing of the *Word for Windows* and PostScript documents on the pass/fail tests.

For the most part, this is a no-brainer box. Set it up, plug in the cables, put it in the closet, and when problems arise, check out the control panel LCD. Just about any operation can be handled and set from the box—headers, form feeds, port redirections, priority status—and everything else can be managed from DOS. If you do run into trouble, IMC offers a one-year warranty with a toll-free support line.

As for options, IMC offers signal-boosting parallel converters with independent power supplies for \$59.95, 10-foot and 100-foot cables at \$2.50 and \$25.00 each, and buffer memory upgrades at \$300 per 2MB. The 16-port version of the XL lists for \$1,295.

This is a plug-and-print product. Once the software catches up to the current DOS, the Data Manager XL-100 will be

an even more versatile printer-sharing device than it is now.

PROTEC MICROSYSTEMS INC.
**Byteway 1000
Plus 8P1MB**
by M. David Stone

If you're looking for a printer-sharing device that provides network-like control over printer use, take a look at the Byteway 1000 Plus 8P1MB. This parallel-only unit from Protec Microsystems Inc. lets you control which PCs can print on which printers, and it provides password security for changing the setup.

The Byteway 1000 Plus actually comes in several flavors. The 8P, which is the version we tested, offers eight parallel ports with female DB-25 connectors. One port is dedicated to input and one to output, leaving six that are user-definable. There is also the 8S, with eight serial ports, and the 4P4S, with four serial and four parallel ports. The base price in each

case is \$685 with 256K RAM, \$755 with 512K, and \$895 with 1MB; all prices include a one-year warranty. Our review unit included the full 1MB.

Cabling for the 8P model can be expensive, since you need 25-wire shielded cables for each port. Protec neither includes any cables with the unit nor sells them as options, so you'll have to get them elsewhere. For printers, the unit uses the same printer cable that otherwise connects directly to a PC. For PCs, it uses a straight-through cable.

The Byteway 1000 Plus allows surprisingly long cables. One of the drawbacks of parallel connections is that they are normally limited to much shorter lengths than serial connections. Protec, however, claims that the Byteway 1000 Plus can handle a maximum cable length of 100 feet. Indeed, in our tests, the 100-foot connection worked without problems.

THREE-STEP INSTALL

Getting the unit up and running takes three steps. The first step, installing the hardware consists merely of plugging all the cables in. The second step, installing the software on each computer's hard



Just a second.

All of this becomes even more remarkable when you consider the price of the 9600EX. Just \$799. It's a price, in fact, that rivals high-end 2400 modems. It's also an example of Intel's commitment to affordable quality.

For more information, call 800-538-3373. Or for information faxed to you, call 800-525-3019 and

request Doc.#9986. But don't wait, because with all the 9600EX offers, it will go in a second.

intel®

The Computer Inside.™

CIRCLE 749 ON READER SERVICE CARD

CONNECTIVITY

PRINTER-SHARING DEVICES

disk, is almost as easy thanks to an automated install program. (You can skip this step for any PCs that you plan to limit to using a single printer.) The third step—configuring the printer-sharing options—is somewhat more difficult and may present a problem to all but the most experienced users.



Byteway 1000 Plus 8P1MB

Protec Microsystems Inc., 297 Labrosse, Montreal, Quebec H9R 1A3, Canada; 800-363-8156, 514-630-5832.

List Price: Including 1MB RAM, eight parallel ports, \$895.

Requires: 21–37K RAM per PC, cables.

In Short: One of only two units to pass all of our pass/fail tests, the Byteway offers features such as letting you define which workstations can print to which printer. Despite its parallel connections for up to two printers and six workstations, the unit offers decidedly below-average performance.

CIRCLE 427 ON READER SERVICE CARD

One minor issue is that you can't even get to the configuration menu unless you know the password: "PROTEC" as shipped, an easy-to-miss item in the manual. A more important issue is that the manual may be confusing to less experienced users, since it covers both the parallel and serial versions of the unit. If you run into trouble, Protec does offer a toll-free number for technical support.

Once you have the Byteway 1000 Plus set up, using it is straightforward. The package includes control software that lets you run commands such as selecting a printer from a menu. Even better is an editor that lets you add, change, or delete the menu choices and the commands that go with them. You can run the control software either as a TSR or as a foreground program.

If you choose to run it as a TSR, you can pick the hotkey from various combinations of Alt, Ctrl, and Shift keys. The TSR can take from 21K to 37K of RAM, depending on the video card in the PC.

SLOW YET RELIABLE

On PC Magazine Labs' tests, the Byteway 1000 Plus generally handed in lower-than-

average times across the board. But it was also one of only three units to sail through all the pass/fail tests without a problem. Unlike many of the programs included with these devices, the TSR had no trouble popping up over *Microsoft Word* in graphics mode, or restoring the screen afterward. In short, the package may plod on occasion, but it always gets where it's going.

The bank of LED status lights on the front panel makes a nice touch. In addition to the power-on light, you'll find a status light for each port, indicating which ports are active at any given instant. Most of the time, such status indicators are irrelevant. When you run into a problem, though, they can be invaluable for troubleshooting.

It's also worth noting that you're not likely to run out of room for expansion. The Byteway 1000 Plus will let you cascade units ten-deep, so you can easily have more ports available than you are ever likely to want on a printer-sharing device.

The key strength of the Byteway 1000 Plus is its flexibility. If all you need is a plug-and-play unit that lets any of several computers use either of two parallel printers, the Byteway 1000 Plus is probably the wrong choice. But if you need administrative functions—like password security, definable ports, and limiting access to particular printers—this unit may well be worth the marginal extra work involved.

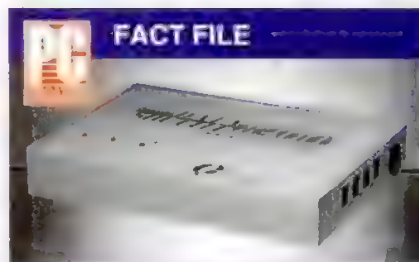
Q4 INSTRUMENTS INC.

Data Shuttle 8400

by M. David Stone

With a base price of \$899 for a system with 256K, and \$923 for a unit with 512K, the Data Shuttle 8400 from Q4 Instruments Inc. may seem on the high side of average. But the cost includes twelve ports—eight serial and four parallel—which is more than any other unit we reviewed. If the added functionality doesn't interest you, you'll find other features that might, including some of the best overall scores for the PC Magazine Labs timed performance tests.

The price for the Data Shuttle 8400 can run as high as \$1,819, but that's with 8MB RAM—an option that may be of interest if, for example, you regularly print huge



Data Shuttle 8400

Q4 Instruments Inc., 1100 Invicta Dr., Unit 7, Oakville, Ontario L6H 2K9, Canada; 800-268-5156, 416-842-0200.

List Price: Including 1MB RAM, eight serial and four parallel ports, \$971.00; as tested, two 40-foot parallel straight-through cables, three six-wire telephone-style cables, one 100-foot six-wire telephone-style cable, \$1,111.30.

Requires: 17K RAM per PC, DOS 3.0 or later, cables.

In Short: Offering enough ports for ten workstations even with two printers attached, the Data Shuttle 8400 also performs better than any product we tested when sending print jobs. It's fairly easy to set up and appropriately invisible to the user.

CIRCLE 428 ON READER SERVICE CARD

graphics files. The system we reviewed, with 1MB of RAM, sells for \$971 without any cables. Q4 also sells a slightly less expensive model, the 6200, which is identical to the 8400 except that it has fewer ports—six serial and two parallel. All prices include a one-year warranty.

The Data Shuttle 8400's eight serial ports use modular 6-wire telephone-style cable, which Q4 sells for \$8 plus 28¢ per foot, including the adapter for a PC serial port. The parallel ports use straight-through cables for PCs or standard printer cables for printers. Q4's prices for either version are \$19.95 for 10 feet, \$25.95 for 15 feet, and \$31.95 for 35 feet, with other lengths available. The tested unit, with the two parallel and four serial cables required for six PC-to-device connections, sells for \$1,111.30.

The Data Shuttle lets you use any port for either a printer or PC. The hardest part of installation, in fact, is deciding what device plugs into each of the Data Shuttle's connectors. One of Data Shuttle's extras is that it allows you to connect any port to any other on command. The package doesn't include any file-transfer software or other programs that would qualify it as a zero-slot LAN, so you may choose to ignore this feature. If you wish, you can use it to transfer files by way of your favorite communications program. The same feature will let you share a modem connected to one of the Data Shuttle's serial ports.

INTRODUCING MANNEQUIN™...DRAWING & DESIGN ON A MORE HUMAN SCALE.

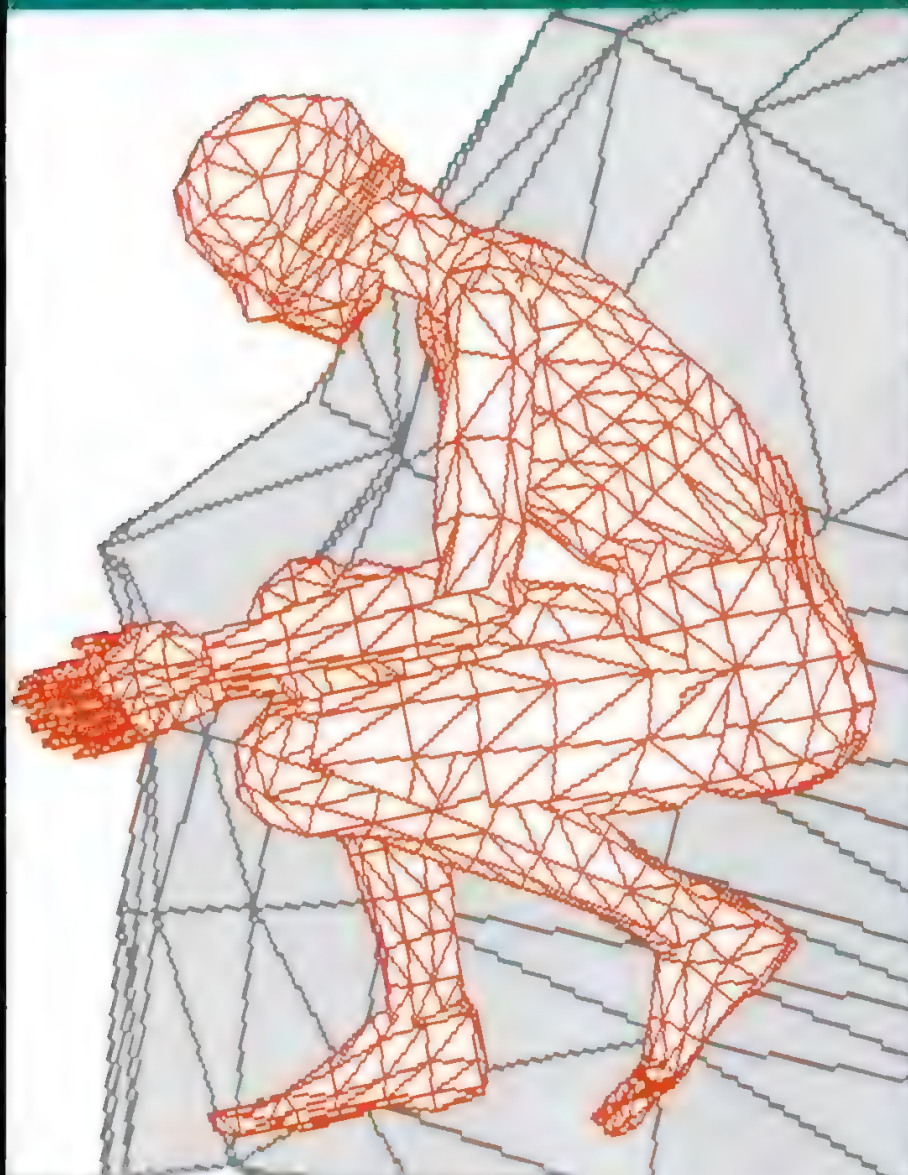


Image created by Gary Yost. Mannequin was exported via DXF into Autodesk 3D Studio™

CIRCLE 260 ON READER SERVICE CARD

Copyright 1991 Biomechanics Corporation of America. All rights reserved. Mannequin is a product and trademark of HUMANCAD, a division of Biomechanics Corporation of America. All other company and product names are trademarks or registered trademarks of their respective companies.

Most designs are for people. But most drawing and design programs don't let you see how designs work with people.

Until now. Introducing Mannequin,™ a revolutionary new software program that actually lets you put people in your designs and drawings.

Using extensive ergonomic data, advanced technology and graphics, Mannequin lets you develop moving, fully dimensional 3D human likenesses that can see, walk, bend, and grasp objects.

With Mannequin, you can have people walk through your buildings. Work in your factory. Use your product. You can even see what a person would see from any point in an environment!

The result—you can produce better presentations and designs because they take the people who use them into account.

Mannequin works with AutoCAD,™ Generic CADD,™ and most other PC CAD packages, as well as with most popular graphics programs, such as Micrografx® Designer,™ Corel Draw,™ PC Paintbrush,™ Harvard Graphics,™ and Aldus Pagemaker.™

To find out more, or for the name of your Mannequin dealer, call us toll-free at 1-800-437-4441.

And add a human touch to your designs.



HUMANCAD

1800 Walt Whitman Road
Melville, New York 11747

Tel: 516-752-3568

Fax: 516-752-3507

Crunch!

Nothing crunches numbers like the Advanced Math Co-Processors from Integrated Information Technology. They really speed up graphics, CAD/CAE, spreadsheets, and other calculation-intensive applications.

Three models provide a perfect match to your 286, 386, or SX PC, delivering up to twice the performance of other CoProcessors. No wonder hundreds of thousands have been sold. Five-year limited warranty. BYTE-rated. So plug in, and crunch!

Count on iit.SM



INTEGRATED
INFORMATION
TECHNOLOGY

Available at most local dealers.

CONNECTIVITY

PRINTER-SHARING DEVICES

If you plan to transfer files or share a modem, you'll want all PCs attached to serial ports, since the parallel ports aren't bidirectional. For our tests, we used two parallel ports for the printers, the remaining two for PCs, and four serial ports for the additional PCs.

Installation of the Data Shuttle is standard fare. You configure the unit from one PC, defining such settings as the speed for each serial port. You then copy the control software to each computer. For systems using serial ports, you add MODE commands to the AUTOEXEC.BAT files to initialize the comm port and redirect printer output to it. As with many printer sharers, the Data Shuttle includes a utility

for setting the PC port to speeds up to 115,200 bps. In most cases, you'll want to run this utility from the AUTOEXEC.BAT file along with the control software in its TSR mode. The TSR mode uses Alt-Period for its hotkey and needs 17K RAM.

Although none of these steps are difficult, they can be confusing if you don't know your way around a serial port. Less-experienced users will appreciate the step-by-step instructions in the manual along with the install program, which handles much of the work. If all else fails, Q4 Instruments provides a toll-free support line for help, although it's limited to nor-

mal business hours, E.S.T.

Once installed, the Data Shuttle is largely invisible, as it should be. The only problem it had with our pass/fail tests was popping up the TSR program over *Microsoft Word* in graphics mode. But even there, the commands work. The problem is strictly with screen handling.

SPEED TO SPARE

As already mentioned, the Data Shuttle turned in excellent overall performance results on our timing tests. It managed the best results of any unit for the Time to Send test and was generally in the top tier for the Time to Print tests. What's more, it turned in this high-powered showing

PRINTER SHARING PLUS: Five Hardware-Based Zero-Slot LANs

by M. David Stone

In addition to the nine products we reviewed, we looked at four hardware-based zero-slot LANs that essentially meet the criteria we set for the printer-sharing devices. 3X-Link 16 from 3X USA Corp., Altnet from Equinox Systems Inc., ChainLink from ConnectWorks Co., and EasyLAN/QuickConnect from Server Technology Inc. can all let six or more PCs share one or more parallel printers at a price of under \$150 per PC port. A fifth system, PC♥Mac from Newbridge Networks Inc., is priced a bit higher but is of special interest because it includes software for the Macintosh as well as for DOS.

These five packages have much in common with printer sharers. In particular, the hardware in each case is some type of data switch, meaning that you can connect any workstation port to any other port. But all come with software that takes them beyond printer sharing and endows them with local area network capabilities on a small scale. Every one provides file transfers as an integral part of its package; all but the PC♥Mac offer e-mail as well.

The major cost for these additional features is increased complexity. A zero-slot LAN (hardware-based or otherwise) inherently needs a more complex set of commands than does a printer sharer. In addition, the software for these zero-slot LANs needs

more RAM, with the full program taking up 42K to 100K, compared with an average of 17K for the printer sharers reviewed here. Here's a quick look at each package.

3X-Link 16 is a distributed data switch with the hardware spread out among various computers rather than centralized in one printer sharer. Each 3X node is about twice the size of a DB-25 connector. It plugs into a parallel port and provides a female DB-25 where you can plug in a printer. The 3X network will link nodes on up to 16 computers. Each computer can use any printer attached to another computer on the network, with a maximum of 16 printers.

The product is unusual in letting you load the printer-sharing module by itself, but 3X-Link 16 also includes file-transfer and e-mail features. Printer redirection requires under 7K of RAM, but the full TSR, which includes a manageable print queue, takes 77K. The package spools print jobs to disk. The price for 3X-Link 16 is \$279 for a starter kit with two nodes, plus \$139 for each additional node. According to 3X USA, 3X-Link does not work with *Microsoft Windows 3.0* but has no known problems with *DESQview*.

Altnet is ideal for connecting two widely separated workgroups. This \$995 unit offers eight serial ports plus a dedicated port for connecting by cable to another unit up to one mile away.

The maximum number of workstations is 16, or 8 for each unit; the maximum number of printers is 48. Any computer can print to any printer on the network, with print jobs spooled to disk.

Other features in the Altnet software include file transfers, e-mail, and some limited ability to manage files locally and remotely. The full TSR requires a substantial 64K of RAM, and the software does not work with *Microsoft Windows 3.0* or *DESQview*.

ChainLink is almost as easy to set up as a typical printer sharer, which makes it the easiest zero-slot LAN to install by an order of magnitude. ChainLink is also easy to use, thanks to a largely self-explanatory menu system. ConnectWorks offers versions for 4 to 16 users at prices from \$395 to \$895. In all versions, all computers plug into a single box. As with Altnet, the network can have up to 48 printers, with 3 on each computer. Any computer can send to any printer, with print jobs spooled to disk.

Other features include file transfers, e-mail, file management on both local and remote computers, a chat mode, and a TSR that uses 49K of RAM with printer sharing. The ChainLink software does not work with *Microsoft Windows 3.0* or *DESQview*.

EasyLAN/QuickConnect comes complete with cables and two complete sets of adapters, for plugging into

CONTINUES

LEO BURNETT IS SOLD ON ALL OF



ADVERTISING THESE NETWORKS.

Leo Burnett Advertising knows the value of selecting top-rated network programming for its clients. And for its computers.

So when Burnett's information services group decided on a PC-based network, they chose NetWare®; the only network operating system that's in its eighth generation. According to Bill Engelbrecht, executive vice president of administration, "The network we installed must take us beyond the year 2000. That's why we chose to align ourselves with the leader in networking."

Needless to say, long-term relationships are nothing new to Burnett. After all, Burnett has retained some of this country's premier advertisers for decades, growing into one of America's largest advertising agencies with billings exceeding \$3.2 billion.

"One of our strategic goals is global connectivity between the 49 offices we maintain around the world, and the ability to further improve communication with our clients," recalls Engelbrecht. "With NetWare, many of our clients have access to information on our network, giving us a competitive edge in account service."

Burnett's network, which was

installed in just three days, spans 29 floors to link 1,200 personal computers, integrate an IBM mainframe and provide remote connectivity. In fact, its advanced capabilities earned Burnett the Excellence Award from the Enterprise Networking Institute.

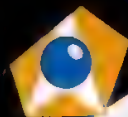
But beyond exceptional functionality and the industry's tightest security, NetWare offers something other solutions simply can't—compatibility with more applications, computing environments and hardware than any other network operating system.

So call 1-800-LANKIND for your NetWare Buyer's Guide. And learn how NetWare is helping make Leo Burnett a commercial success.



**The Past, Present, and Future
of Network Computing.**

CIRCLE 322 ON READER SERVICE CARD



NEWIDEA

A Mouse That Will Move You

New Idea 2.5-Button Beetle Mouse

- Works as Microsoft® Mouse and Logitech® Mouse, AUTOMATICALLY. No switch setting needed.
- 320-DPI-Base high resolution plus on-line acceleration control.
- 100% Windows 3.0 compatible.
- Includes high quality mouse pad, paint software and 9-25 pin adaptor
- Winner of TIDEX '90 Design Award
- Patented 2.5-Button design
- Available in 15 designer colors

\$69.00
Suggested
Retail

Exclusively Distributed for the USA/Canada by:



1 800 332-3475
1 414 242-8800

Products Designed and Manufactured by: **New Idea Electronic Co., Ltd.** FAX: 886-2-704 6034 Tel: 886-2-704 1333
Microsoft and Logitech are all trade marks of their original manufacturers.

CIRCLE 238 ON READER SERVICE CARD

CONNECTIVITY PRINTER-SHARING DEVICES

five units for a total of 32 available serial ports and 20 available parallel ports. If you need more than that, you should probably be looking at a true LAN. But if what you need is a printer sharer, the Data Shuttle 8400 is one of your better choices.

ROSE ELECTRONICS **FastPrint 8S2U/5X** by M. David Stone

Rose Electronics offers enough choices in printer-sharing devices to meet virtually

any need. Whether you want serial or parallel ports or the flexibility to define ports either way, whether you want as few as 3 ports or as many as 17, Rose can probably provide you with an appropriate model. For our tests, the company supplied the FastPrint 8S2U/5X, a designation that translates to eight serial ports and two user-definable ports with 512K RAM. Prices for the FastPrint run from \$749 with 256K RAM to \$1,199 with 2MB. The 512K version sells for \$799; as tested, with that much memory and cables for six PCs, the product costs \$904.

The interesting thing about FastPrint is that it lets you define two ports as serial or parallel. Both are dedicated output

Printer Sharing

CONTINUED

either DB-9 or DB-25 connectors. The price is \$449.95 for a four-user version or \$599.00 for eight users. If you need more, up to three units can be cascaded to allow a maximum of 20 computers on the network. Like 3X-Link 16, Alternet, and ChainLink, EasyLAN lets systems share printers connected to other computers. The maximum of three printers per computer yields up to 24 printers on an eight-user network. Here again, print jobs are spooled to disk. Other notable features include file transfers and e-mail. Server Technology says that EasyLAN works with *DESQview*, and that it allows printer sharing and file transfers with *Microsoft Windows 3.0*. The TSR needs 40K RAM.

PC♥Mac is more expensive than other packages covered here, with a price of \$1,395 with 256K RAM, or \$1,635 with 1MB. As you might expect, the unit uses the RAM as a buffer, rather than spooling to disk. And as you might guess from the buffer, the unit lets computers share only those printers that plug into the data switch itself.

The maximum number of printers that can be used with PC♥Mac depends on the number of computers. You can define any of the eight serial and two parallel ports for either purpose, and you can cascade up to 32 units. The full TSR program requires a hefty 100K, but the package needs

The major cost for the additional features of zero-slot LANs is increased complexity.

just 28K to provide printer sharing.

Additional features include file transfers and a chat mode. Newbridge Networks says that the package has no known problems with *DESQview* and will work with *Microsoft Windows 3.0*, except in 386 enhanced mode. Both Macintosh and PC software are standard. ■

3X-Link 16

3X USA Corp., 1 Executive Dr., Fort Lee, NJ 07024; 800-327-9712, 201-592-6874.

List Price: Starter kit with two nodes, software, one 12-foot cable, \$279; each additional node, \$139.

Requires: 77K RAM for full TSR, hard disk for spooling computers, DOS 2.1 or later. Hard disk recommended for additional workstations.

CIRCLE 416 ON READER SERVICE CARD

Alternet

Equinox Systems Inc., 14260 SW 119 Ave., Miami, FL 33186; 800-328-2729, 305-255-3500.

List Price: Eight-port unit with one DB-25 adapter, one DB-9 adapter,

and one 25-foot cable, \$995.

Requires: 64K RAM for full TSR, hard disk on each system, DOS 3.0 or later.

CIRCLE 417 ON READER SERVICE CARD

ChainLink

ConnectWorks Co., 110 Causeway Dr., Wrightsville, NC 28480; 800-992-5465, 919-256-2366.

List Price: 16-user system, \$895; 8-user system, \$695; 4-user system, \$395. All versions include two 20-foot four-wire telephone cables. **Requires:** 42K-49K RAM for full TSR, hard disk on each system, DOS 3.1 or later.

CIRCLE 418 ON READER SERVICE CARD

EasyLAN/QuickConnect

Server Technology Inc., 2332-B Walsh Ave., Santa Clara, CA 95051; 800-835-1515, 408-988-0142.

List Price: Eight-user version, with eight 30-foot cables, eight DB-9 and eight DB-25 adapters, \$599.00; four-user version, with four 30-foot cables, four DB-9 and four DB-25 adapters, \$449.95. **Requires:** 40K RAM for full TSR, hard disk for each system with print spooler (recommended on all systems), DOS 2.1 or later.

CIRCLE 419 ON READER SERVICE CARD

PC♥Mac

Newbridge Networks Inc., 593 Herndon Pkwy., Herndon, VA 22070; 703-834-5360.

List Price: Ten ports with 256K RAM, Macintosh and PC software, \$1,395; with 1MB RAM, \$1,635.

Requires: 100K RAM for full TSR, hard disk recommended, DOS 2.0 or later.

CIRCLE 420 ON READER SERVICE CARD

Printer Sharing Solutions

5 or 10 Ports



- * **Reliable Automatic Switching**
- * **Easy to Install and Use**
- * **No PC RAM Memory Required**
- * **Toll-Free Technical Support**
- * **45-Day Money-Back Guarantee**



HWP 5 Ports

HWP-256	with 256KB	\$325
HWP-512	with 512KB	\$375
HWP-1000	with 1MB	\$425

User Upgradable Memory:
From 256KB to 16MB buffer

Input/Output Settings – 4/1 or 3/2:
All parallel ports; user configurable as either three inputs to two outputs, or four inputs to one output, buffered auto-switch

Rapid Data Transfer – 100,000 cps:
The HWP uses Direct Memory Access (DMA) for data transfers into the buffer, making the HWP hardware capable of receiving parallel data at the high rate of 100,000 characters per second.

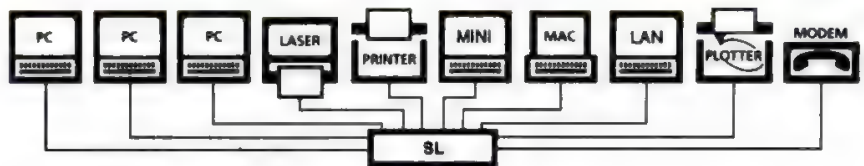
Pop-up Menu or Front Panel Buttons:
Use either the pop-up menu or the front panel switches to select printers, select the next available printer, send multiple copies, clear data, and other functions.

AS-41 5 Ports \$200

Smart Switch – No Pop-up or Buffer:
Four parallel inputs to one parallel output, electronic automatic switch with no buffer

SPPS (not shown) \$100

Interface Converter – No Buffer
Combination serial-to-parallel, or parallel-to-serial interface converter in a single unit; low-power CMOS design derives power from serial connection, no power supply needed; supports 9,600 to 115,200 bps, DIP switch configurable



Save Money by Sharing Office Resources:

The SL is the peripheral sharing solution which enables everyone to share lasers, printers, plotters, and modems. The HWP is ideally suited for sending large graphics files, but is economical enough for any kind of printing within a small workgroup.

Greater access by more users reduces unproductive idle time and the expense of purchasing additional peripherals. With a buffer, all users can simultaneously send print data and quickly release their PCs to continue working.

BUFFALO

We are the world's largest manufacturer of buffered data switches for PCs which assures your getting the best value and highest performance from our products.

Call For More Information
(800) 345-2356

Fax (503) 585-4505

Buffalo Products, Inc.
2805 19th St. SE, Salem, OR 97302-1520

SL or SLP 10 Ports

SL or SLP-256	with 256KB	\$495
SL or SLP-512	with 512KB	\$575
SL or SLP-1000	with 1MB	\$675

Two Configurations – Ten Ports Each:

SL – four parallel and six serial ports

SLP – eight parallel and two serial ports

Both include 15 ft. serial null-modem cable

User Upgradable Memory:
From 256KB to 4MB buffer

Any Combination of Printers or PCs:
All ten SL or SLP ports can be software configured as either input or output.

Automatically Routes and Buffers Data:
Automatic switching and queuing of jobs; automatically converts data from parallel-to-serial or serial-to-parallel

115,200 bps PC-to-PC File Transfers:
Transfer files serially between PCs up to 115,200 bps; buffer serial data to the SL several times faster than normal 9,600 bps

Pop-up Menu via Hotkeys or Mouse:
Keyboard selection of printers and many other control functions; pop-up is for convenience, but is not required

Simple Installation:
Plug in your cables; if desired, run the installation software for the pop-up menu

CIRCLE 328 ON READER SERVICE CARD

ports, and the unit provides two connectors for each: a female DB-25 for parallel and a six-wire modular connector for serial connections. While you'll want to use the parallel connection, it's useful to have the serial connection, should you have a printer or plotter that lacks a parallel port. You can also use the serial port for a modem, although we didn't test this.

The eight serial-only ports are all dedicated to PCs or equivalent workstations; in our tests, we connected only six systems. These serial ports use modular four-wire telephone-style cable, which helps keep the cost of cabling down. Rose helps supply cables of any length, at \$2 plus 25 cents per foot for standard flat modular cable, or \$1 plus \$1 per foot for special Teflon cable intended for threading through ceilings. Adapters for plugging the modular cable into a serial port are \$12 for either a DB-25 or a DB-9 version. The maximum recommended cable length for serial connections is 250 feet.

Installing FastPrint is straightforward. Plug in the cables, copy the software to each system, then add two MODE commands to your AUTOEXEC.BAT files to initialize your comm port and redirect printer output to the comm port.

In addition, you'll generally want to set the FastPrint ports and your serial ports to 115,200 bps. This is a two-step

The interesting thing about FastPrint is that it lets you define two ports as serial or parallel.

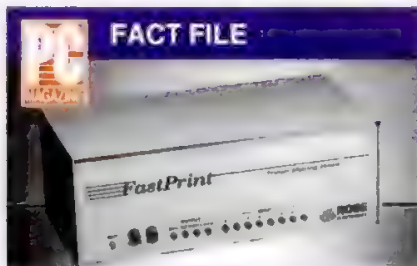
process. First configure FastPrint for 115,200 bps. Then add a command to your AUTOEXEC.BAT files to run Rose's utility for setting the PC port to 115,200 bps. The FastPrint manual does an adequate job of explaining the process.

Along with the utility for setting your comm port's speed, Rose provides a 12K TSR program for sending commands to FastPrint. You'll also find an editor that lets you add, change, or delete the choices on the pop-up menu, and edit the command that each menu choice sends. Other

CONNECTIVITY PRINTER-SHARING DEVICES

options for sending commands to the printer include running the software as a foreground program and sending the commands through batch files.

The FastPrint test results were uneven. On the Time to Send test, it was one of the fastest units. But it was one of the worst in



FastPrint 8S2U/5X

Rose Electronics, 10850 Wilcrest Dr., #900, Houston, TX 77099; 800-333-9343, 713-933-7673.

List Price: Including 512K RAM, eight serial and two user-definable ports, one 10-foot four-wire telephone-style cable, \$799; as tested, with five 10-foot four-wire telephone-style cables, one four-wire telephone-style 100-foot cable, six adapters, \$904.

Requires: 12K RAM per PC, DOS 1.0 or later, cables.

In Short: While its performance on our tests was mixed, FastPrint offers an unusual touch for its two printer ports by providing a modular connector for serial hookups, a DB-25 for parallel connections, and the choice of either connection for either printer.

CIRCLE 429 ON READER SERVICE CARD

four out of five Time to Print tests. The TSR also had problems popping up with *Microsoft Word* in graphics mode.

According to Rose, you can cascade additional units with FastPrint, but it's not recommended because cascading will slow down output—something that's clearly not needed. Much better, according to Rose, is to cascade FastPrint with other Rose units.

The FastPrint's two strongest features are its eight workstation ports and the flexibility that lets you define the printer ports as parallel or serial. Its weak point is the lower-than-average print speed. If return of keyboard control is more important to you, however, you may be willing to accept the print speed—in return for the faster-than-average speed of sending a print job to the printer sharer. ■

Kellyn S. Betts, Greg Pastrick, and Ed Perratore are frequent contributors to PC Magazine. M. David Stone is a contributing editor of PC Magazine.

Computers, FCC Class A, Class B, and You — or When is it better to get a B than an A?

You need to know the difference between computers that meet the FCC class B radio frequency emissions standards and those that meet only the Class A standards.

Computers emit radio signals in their operation. Because these signals may cause interference to radio and television reception, the marketing and the use of computers is regulated by the Federal Communications Commission. Under federal rules, computer users are responsible for remedying interference, including interference in neighboring homes.

Computers certified by the FCC as meeting the Class B standard are less likely to cause interference to radio and TV reception than those that have been verified by the manufacturer or importer to the Class A standards. Only Class B certified computers may be advertised, sold, or leased for use in residences. A similar regulatory program applies in Canada.

Buyers seeking computers for use in homes (including offices at home) should shop for computers and peripherals which have been Class B certified. These devices carry a label with an FCC ID number. Both new and used Class A verified devices may be sold only for use in commercial and industrial locations. Signals from computers are more likely to be masked by electrical noise from other equipment in such an environment. These areas are also likely to have fewer radios and TVs. Accordingly, equipment marketed only for use in these locations may meet the less rigorous Class A standard. Class B certified equipment may be marketed for use in residences as well as commercial and industrial locations.

As you shop for a computer for use in your home, look for the FCC classification in the specifications or ask your vendor to recommend only machines that have been certified to the Class B limits. TV viewers and radio listeners in your home and in neighboring homes will be glad you did.

If reading this ad doesn't convince you to buy File Director, perhaps reading this book will.

Even if you're familiar with DOS commands, managing your files can be a slow and tedious task. And if you're working by the book, things can come to a grinding halt.

That's why you need File Director.™

All the basic DOS functions are right at your fingertips with File Director's easy-to-use menu. You can copy, rename, move or delete files. Locate them, search for text strings and more—all with simple point-and-shoot commands. And you can do the same with directories, directory trees, or entire disks.

File Director also lets you do things DOS can't. Like view all the files on your logical drives at once. Scroll through directories and see the actual contents of

files in a separate window. Mark files from different directories or drives and perform one-touch commands. Even launch programs from File Director's Applications menu.

To find out more about File Director, call 1-800-873-4384.

Buy File Director now and get a free copy of Mace Performance,™ the \$69 hard disk optimizer. Just write "DOS Manual" on the registration card and return it to us. This is a limited-time offer, so book yours today.

CIRCLE 232 ON READER SERVICE CARD



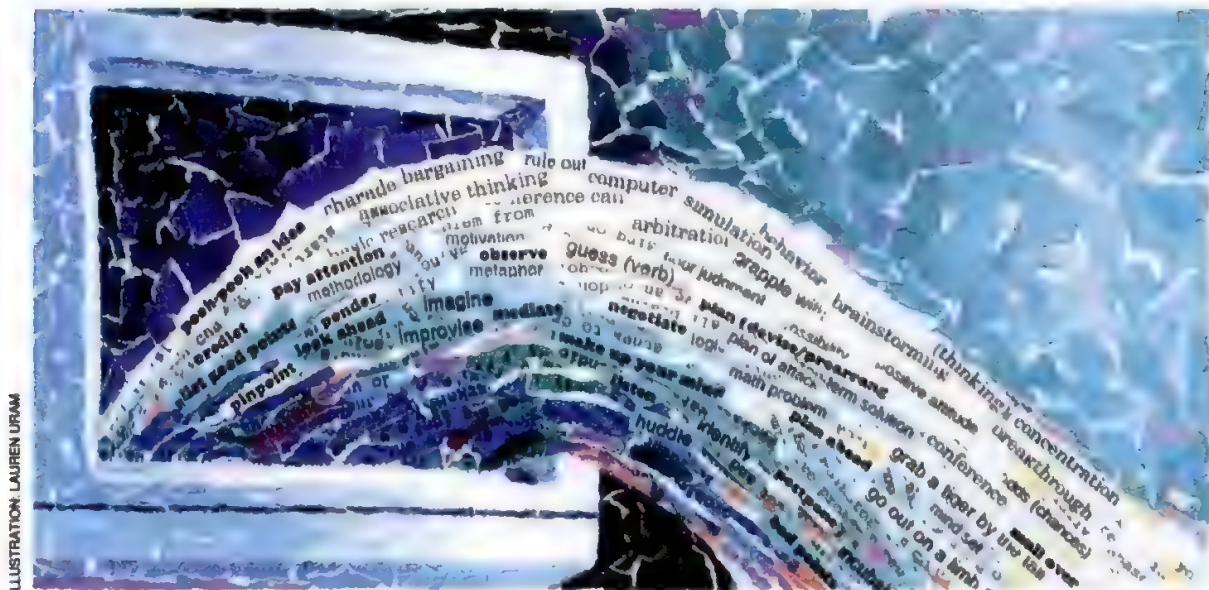


ILLUSTRATION: LAUREN URAM

BRAINSTORMING SOFTWARE

It's hard to be creative
on demand whether
you're an artist, a
businessperson, or
something in between.

A Free Flow of Ideas

Jump-start your
thinking with the
gentle prodding
of these three
idea-generating
packages.

You and your colleagues are gathered in the conference room once again, struggling to come up with the perfect headline and art concept for your next magazine advertisement. You've spent an hour toying with clichés and bad puns and now you've come full circle, wondering if maybe your first ideas (however lukewarm) were the best ones. "What we need," says the boss, "is some real brainstorming."

Brainstorming. The word calls to mind images of turbulent creative thinking: ideas,

words, pictures, and concepts set loose with fearless enthusiasm by intelligent people. Riding the winds of creativity and capturing the inspiration just when it's needed is exhilarating. Do it, and you're the idea person, the daring freethinker. Get caught in the brain-dead calm of lost inspiration when you're faced with a deadline, and you're no help at all. When all the usual methods fail, you need to explore new techniques to open up ideas, options, and choices.

by Greg Pastrick



EDITORS' CHOICE

● *IdeaFisher*

IdeaFisher is a real standout among the three brainstorming packages reviewed in this issue. Sure it's big and expensive, and learning to navigate through its screens and menus is certainly not effortless, but the sheer power and breadth of its associations make it a brainstorming tool without peer. It guides you through the creative thinking process and offers unlimited opportunities to make inspired connections. With the addition of new window control, clipboard, and Association Librarian features in the latest release, *IdeaFisher* is an even better package than it was when we named it one of the Best Products of 1989.

While brainstorming software has gone virtually unnoticed, you may find the productivity gains it yields surprising. By definition, brainstorming is a collaborative effort. One person's ideas trigger another person's ideas, which triggers even more ideas. With these packages, you do all the thinking, but the software encourages you and pushes you along. There are only a handful of these packages out there, and we've evaluated three that range in price from \$75 to \$595: The latest releases of *Brainstormer* from Soft Path Systems,

IdeaFisher from Fisher Idea Systems, and *The Idea Generator Plus* from Experience in Software. There's also a quick look at two brainstorming tools designed specifically to help writers (see the sidebar "Breaking Through Writer's Block").

A new marketing strategy, magazine article title, or advertising campaign is the result of hours of work, with lots of lousy ideas tossed out and a few good ones developed. Brainstorming software, also known as idea-generation software, has been around almost from the day PCs landed on desks in corporate America. There are creativity enhancing elements in writing tools, decision support software, outliners, and PIMs, but none of those are designed specifically to address business problem-solving tasks the way these three packages are.

LATERAL THINKING

While the number of brainstorming packages is small, the approaches to creative problem solving they use are numerous. Each package has its own methods of getting you to look at problems in new ways. At the low end is *Brainstormer*, developed by an experimental psychologist. It uses a mathematical model to identify the recurrent ideas that you express.

IdeaFisher is designed to expand your mind's thought processes and to create chances for problem solution. The goal of the package is to replace serendipity in thinking and to guarantee a steady stream of ideas and options. The real power behind *IdeaFisher* is an exhaustive database of

words and ideas that you jump through in a massive exercise of free association. For a more structured approach to idea exploration, the package has a set of question scripts that target specific tasks such as marketing strategies and new product development. With *The Idea Generator*

You do all the
thinking, but the
software pushes
you along.

you can play role reversal and speculate how an optimist, pessimist, realist, and dreamer would evaluate your situation.

While the theories and philosophical models behind each of these packages represent different approaches to idea generation, the underlying principles to successful problem solving are shared by all. The first is the clear identification and definition of the problem or situation. The aphorism holds true that you have to know what game you're playing before you can change the rules. At one time or another, you've probably wasted time because you neglected to identify the true nature of a problem from the start.

The second principle behind all brainstorming packages is focusing on goals. If you don't have an objective, you'll never get to where you want to go. If you lose sight of your goal, especially in a package like *IdeaFisher* with its extensive databases, you could find yourself stuck in a tangential ditch.

Finally, don't expect too much from any program. The best problem solving tool you have is your own knowledge and experience. Brainstorming software pushes you to evaluate problems or tasks in ways that may not have occurred to you, just like a personal trainer pushes you to do exercises you might not attempt alone. In the end, you still do all the work.

Whether you call them brainstorming, idea-generating, or problem-solving packages, these programs can be rewarding if you accept their assistance while acknowledging their limitations. No, these packages won't think for you, but they're sure to jump-start your creativity when you feel it slowing down.

BRAINSTORMING SOFTWARE:
SUITABILITY TO TASK

PC Magazine assesses each brainstorming package's suitability in five areas—problem definition, goal setting, free-form creativity, outcome evaluation, and result reporting—and assigns a point value for each one. These informed though subjective ratings, using a scale from 0 to 4, are presented along with each review and translate as follows: 0—lacks the feature or is not at all suited; 1—poorly suited; 2—some capability; 3—well suited; 4—ideal for the task.

Problem definition rates the guidance features that direct the user in identifying and clarifying the problem to be addressed in a structured way. **Goal setting** indicates the software's ability to focus the brainstorming session toward a desired outcome. **Free-form creativity** is a measure of the program's flexibility in allowing different angles for problem

Product Name		SUITABILITY TO TASK			
Problem definition					
Goal setting					
Free-form creativity					
Outcome evaluation					
Result reporting					

solving. **Outcome evaluation** is a rating of internal analysis features. **Result reporting** rates the sophistication and presentation of the package's report-generating features.

THE PLUS IS DOS/MAC COMPATIBILITY.

Introducing the Kodak Ektaplug 7016 printer. Equipped with Adobe PostScript language/Appletalk interface options, it can support both DOS and Macintosh computers simultaneously!

Configure it with four ports, and it can support up to four users, or even four networks.

Six emulations make it an ideal shared printer for any work group.

THE PLUS IS 16PPM SPEED.

Twice as fast as traditional printers, the Kodak Ektaplug 7016 printer can make you at least twice as productive. It maintains fast, high-quality throughput, even when printing Adobe PostScript language. It helps you get more done in a day.



THE PLUS IS A COPIER.

Imagine the convenience of having a built-in copier for those frequent one- or two-copy jobs! The Kodak Ektaplug 7016 printer comes standard with a 6 pages-per-minute convenience copier that keeps everybody on the job instead of on the run. For the name of the dealer nearest you, call 1 800 344-0006, Ext. 456.



THE PRINTER WITH A PLUS. KODAK

Kodak Ektaplug 7016 printer



The new look of power.

1988
WINNER
PC Magazine Award
for Outstanding Performance

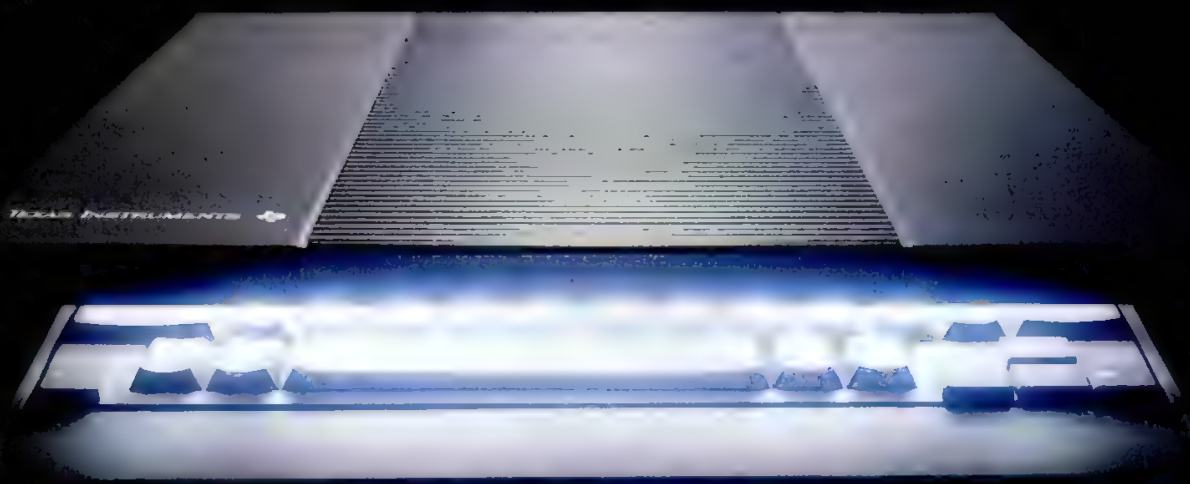


W TravelMate 2000
Texas Instruments, Inc.

1990
BYTE
AWARD
OF
EXCELLENCE

PC WORLD
BEST BUY

PC
MAGAZINE
EDITOR'S
CHOICE



**286 processing in a computer that's notebook size,
1.4" thin and 4.4 lbs. light.**

**Introducing the TI
TravelMate™ 2000
notebook computer —
from the company
that pioneered portable
computing solutions.**

Since inventing the first portable data terminal in 1969, TI has led the way in packing more and more functionality into smaller and smaller products. Now TI brings you the next generation in portable computing — the TravelMate 2000.

This sleek, 4.4-lb. notebook computer gives you the power of a PC-AT® in an ultrathin 8½" x 11" package. It's designed to fit your workstyle — wherever you work — in the office, at home or on the road. Just slip it in your briefcase with your file folders, journals and other business materials, and you're ready to go.



**Large VGA screen with
leadership display technology.**

You'll appreciate the technology behind the 10" diagonal VGA display. It's a remarkable feature for a computer that's notebook size. The high-resolution 640 x 480 supertwist screen easily handles demanding windowing and graphics applications.

**More features to meet
your application needs.**

The TM 2000 has the power to run your favorite software — 12 MHz 80C286 processor, 20MB hard disk drive and 1MB of RAM. A built-in, rechargeable battery lets you work up to two hours. With an optional add-on battery, you can work up to five hours — enough for coast-to-coast flights.

You also get a full-function AT enhanced keyboard, so you can work with the same feel of your desktop PC.

In addition, we've loaded MS-DOS® and LapLink™ in ROM, and preformatted the hard disk.

For more information call
1-800-527-3500.

**TEXAS
INSTRUMENTS**
CIRCLE 353 ON READER SERVICE CARD

SOFTWARE BRAINSTORMING SOFTWARE

Brainstormer

Soft Path Systems' \$75 *Brainstormer* is a legitimate problem-solving and brainstorming tool, but a disadvantaged one when it is compared with *Idea Generator Plus* and *IdeaFisher*. Although Version 2.21 is a revision of the original *Brainstormer*, it's essentially the same program it was when it was introduced some seven years ago.

Brainstormer is based on a problem-solving method called a Morphological

you define the brainstorming task and describe a maximum of ten themes, each with less than 40 characters. For example, if your task is to explore transportation alternatives, you begin by opening an Interest screen and entering the elements of that problem by defining themes—power source, operating medium, and propulsion method might be a few.

Since there are no prompts, canned questions, or problem framing, you have to know the issue you want to explore—

transportation alternatives, in this case. You should also prepare for the brainstorming session by defining the themes of the primary issue. It's like making a marketing pitch because you're forced to cover ground with a focused economy in presentation. What you get in return is only as good as the information you supply; vague themes only lead to weak variations and

unsuccessful probes.

In the Theme mode, you enter variations on the main issues defined in the Interest mode. Again, you're limited to 40 characters per variation and ten variations per theme. You can manually set or restrict the probability that any variation on a theme will occur, a feature that comes into play in the Probe mode.

In the transportation situation above, you can weigh the probability of a solar power source over other power options so that when you perform recombinations of variations on the themes in the Probe mode, solar power will come up more frequently than gasoline, electric, or wind. For more variety, though, you can leave probability at the default setting (equal



FACT FILE

Brainstormer,
Version 2.21
Soft Path Systems,
Cheshire House, 105
N. Adams, Eugene,
OR 97402; 503-342-3439.
List Price: \$75; site license for 10 concurrent
users, \$100.
Requires: 256K RAM, DOS 2.0 or later.
In Short: *Brainstormer* is a no-frills problem-
solving tool that offers the capability to run
millions of ideas; it has variation capabilities,
but the program suffers from low-end
limitations and implementation.

CIRCLE 409 ON READER SERVICE CARD

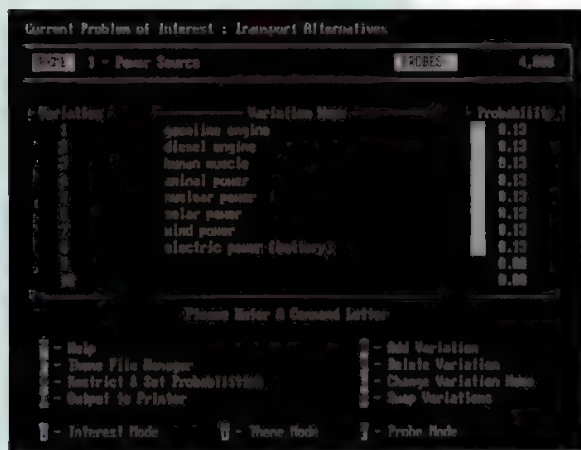
probability) so there's an even chance for all variations to occur.

BILLIONS OF OPTIONS

The Probe mode generates recombinations of the previously defined themes and variations. In this mode you can generate up to ten billion probes on ten themes with ten variations each. The potential of this hearty environment is vast. You can end up with thousands of ideas as fast as you can tap the G key (for Generate Probe) and cycle through all the themes, variations, and combinations.

In our transportation example, a Probe would generate these combinations: power source/human muscle, guiding mechanism/road or street, power source/animal power, guiding mechanism/cable, and so on. If you want solar power to appear in every combination, you would set its probability to Always; to eliminate animal power from all combinations, set its probability to None. You need to cycle through the theme variations in this mode to reach the maximum number of idea combinations. A word of caution: the probe generation is not bidirectional. If you probe through a recombination that you like, it may be a while before it comes up again.

By current software standards, *Brainstormer*'s interface has little going for it. It's sparse and choppy, with severe character entry limitations. The screen blanks momentarily when you input commands, and file management is divided across three separate screens, one for each brainstorming mode. If you save over ten files in each mode, you have to page through up to five screens to locate the file you want. The package comes with basic reporting capability for printing a simple



In *Brainstormer*'s Theme Mode you enter up to ten variations on a basic theme. Here, variations on the theme "power source" are listed with the even probability that any of the variations can be combined with "power source" when recombinations are performed.

Box, which is a matrix constructed of 10-by-10 dimensions that helps to visualize different combinations of ideas. This mathematical model has been used as a theory of discovery and invention, notably in the design of the jet engine in the 1940s. The software based on this principle was developed by Shawn Boles, an experimental psychologist associated with the Creative Research Group at the University of Oregon in Eugene. The bottom line of *Brainstormer*'s esoteric background is that the package offers users a framework to explore seemingly endless combinations of solutions to a defined problem.

A THEME AND VARIATIONS

More self-directed than the other packages, *Brainstormer* sessions take place in three modes: Interest, Theme, and Probe. You begin work in the Interest mode, where

Brainstormer				
SUITABILITY TO TASK				
Problem definition				
Goal setting				
Free-form creativity				
Outcome evaluation				
Result reporting				

SOFTWARE BRAINSTORMING SOFTWARE

outline of themes and variations from any mode screen.

Brainstormer's "my way or no way" design comes with limitations. Lacking an associative database, it doesn't help you explore and define a situation, and it won't guide you through the discovery process. It isn't elegant or exciting, but for \$75, *Brainstormer* can help you to come up with thousands of ideas, and that's not a bad deal.

IdeaFisher

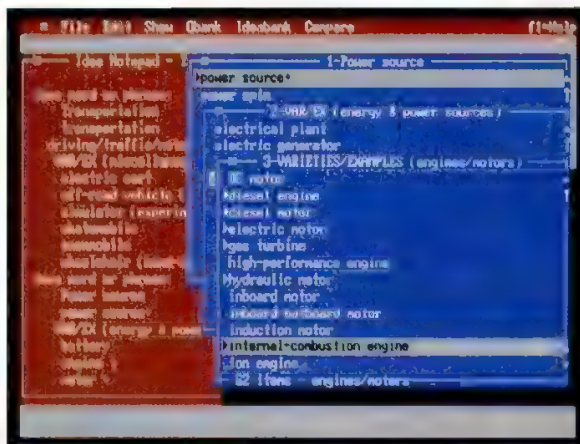
If you need to create new product ideas, marketing strategies, promotional campaigns, names, titles, slogans, stories, or just brainstorm in general, *IdeaFisher* is ingenious. By far the most remarkable and far-reaching of the packages reviewed here, this \$595 package from Fisher Idea Systems is constructed in grand proportions: in theory, implementation, and cost. Designed to mimic the creative thought processes of the human mind, it makes connections between word clusters to help you free associate new ideas. The program comes on 18 installation disks that take up more than 7MB of disk space. The perceived need for a program of this depth, according to its originator, Marshall D. Fisher, is to expand the way the mind thinks and solves problems. In many ways, *IdeaFisher* fits the bill.

At *IdeaFisher's* foundation is the ability to free associate words that will trigger new ideas, but its power goes far beyond

this. For instance, a query on the word "magazine" generates 1,079 associations, from magazine cover, explosives, storage room, and periodicals, to an alphabetical listing of words beginning with "M." Probe deeper by searching on Varieties, and you'll get "newspaper." Search on Parts and you'll get "acrostic," "Ann Landers," or "art work." Search on Varieties of art work, and you'll get "school and styles," "sculpture," "artists," "museums," and "famous artists." Some words, called Base Words, are linked to the 387 topical categories.

IDEABANK DATABASE

IdeaFisher is structured around four windows—IdeaBank, QBank, Notepad, and Question Notepad—that you can display at the same time or separately. You can access the notepads at any time to record your inspirations. The brain behind *IdeaFisher* is IdeaBank, an associative and cross-referencing database that includes 61,000 words, ideas, and phrases that cover just about every conceivable connotation of a word. This thesaurus of exponential proportions is built around 28 major categories, such as Actions, Foods,



The associative power of *IdeaFisher's* database is tested here on the phrase "power source," which produces a list of associations that includes the word "power." When you select the base words "power source" (designating it with a plus sign), links to categories are established for more associations—in this case, types of power sources. A final search on the word "engine" produces examples of 62 kinds of engines and motors.

Agriculture, Business, Families, and Transportation. These are further divided into 387 topical categories, which are broken down to a detailed level where the program does complex lateral thinking. As the example above illustrates, *IdeaFisher* takes a word that you supply and generates all kinds of related words based on these contexts: kind, variety, example, people, animal, thing, place, part, abstraction, intangible, verb, activity, event, processes, and description.

If this isn't enough, you can add to the IdeaBank and create links to existing words and categories. To add a Personal Topical Category, such as *PC Magazine*, scroll to the IdeaBank and add it. The Personal Librarian suggests a location for the new topic, and future searches on "magazine," for example, will include this new entry. For quick associations, you can enable the Compare Topics feature to list matches based on two words or phrases.

BRAINSTORMING SESSION

The QBank window includes three main sections loaded with questions that orient and clarify tasks, modify concepts, and



BRAINSTORMING SOFTWARE: SUMMARY OF FEATURES

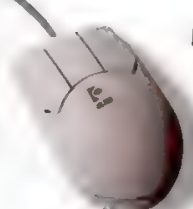
Products listed in ascending price order

	Brainstormer	The Idea Generator Plus	PC IdeaFisher
List price	\$75	\$195	\$595
Number of installation disks	1	1	18
Includes tutorial	■	■	■
FUNCTIONS			
Multiple idea-generation approaches	☐	■	■
Problem-definition assistance	■	■	■
Goal-identification assistance	■	■	■
Customizable questions and prompts	☐	■	■
Built-in analysis and evaluation	☐	■	■
Relational database functionality	☐	☐	■
EDITING AND FILE MANAGEMENT			
Uses working notepads	☐	■	■
Can cut and paste notes	☐	☐	■
Can export files	☐	■	■
Links to other applications	☐	■	■
Generates formatted reports	■	■	■

PC—Editors' Choice ■—Yes ☐—No

**WE CAN'T ALL WORK IN THE SAME SHOES.
WHY SHOULD WE WORK WITH THE SAME MOUSE?**

When you think about it, a one-size-fits-all mouse makes as much sense as a one-size-fits-all shoe. That's why Logitech™ created MouseMan™—the first line of mice designed to fit different kinds of hands. All MouseMan products are ergonomically shaped for comfort and ease of use. They're also totally plug compatible with the Microsoft® mouse. Of course, all come with Logitech's legendary quality and lifetime warranty.



**MouseMan for
the Right Hand**



**MouseMan for
the Left Hand**



**MouseMan
Cordless
Radio Mouse**

For more information, call:

800-231-7717 ext. 2600

In CA: 800-552-8885 ext. 2601.

CIRCLE 182 ON READER SERVICE CARD



Tools That Power The Desktop.



The World's Fastest Typists Will Be Performing On Our Keyboard At Fall COMDEX, 1991.



The search is on to find the fastest typist in the world.

The Key Tronic first annual World Invitational Type-Off finals will be held in Las Vegas in October. You could be the winner and drive away in a brand new '92 Buick Park Avenue — Plus take home \$10,000 cash, a new computer and some great memories of Las Vegas. You could even end up in the Guinness Book of World Records or on national television!

The Key Tronic KB 101 Plus™, approved by Professional Secretaries International®, has been selected as the "official" keyboard for the Type-Off.

The KB 101 Plus uses the industry-standard 101-key layout with enhanced

productivity features to help promote high-speed data entry. The KB 101 Plus is designed for optimum operator comfort — with a low-profile design, adjustable key feel, adjustable legs and a positive tactile feedback. This means consistent touch and low fatigue.

If you or someone you know can make a keyboard smoke, call Key Tronic today and ask for the official entry information packet. This is the computer event of the year, and you can be part of it.

Call 1-800-262-6006

*For Your Official Entry Form.

Washington State call 1-509-927-5515.

*Rules of participation included with entry form. Void where prohibited by law.

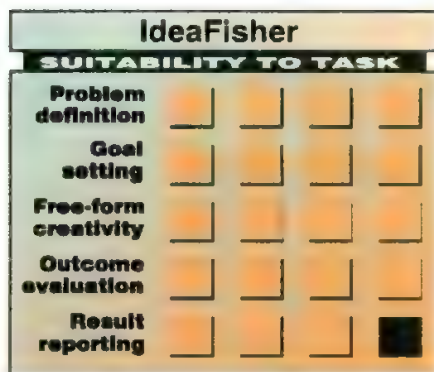
CIRCLE 190 ON READER SERVICE CARD



 **Key Tronic®**

SOFTWARE

BRAINSTORMING SOFTWARE



evaluate outcomes. There's a choice of six detailed question scripts on developing stories, new products, names or titles, themes or slogans, marketing strategies or promotional campaigns, and solutions to general problems. Fisher Systems is developing add-in QBank modules that will be available for \$99 each. The first one will be a Strategic Planning module for business use.

The QBank offers a thoroughly structured way to explore and define your brainstorming task. Developing a solution to a general problem in QBank would work like this: First, *IdeaFisher* asks you if you want to further understand the nature of the problem. It then volleys a round of probing questions, sometimes up to 200, such as What is the essential problem, as opposed to its causes, symptoms, and effects? Who sees the situation differently and in what ways? What is the context of your problem or opportunity? How does it fit into the big picture? How does one affect the other? What other problems are connected with this one or what are the contributing problems? Does one problem cause or lead to another? How? What

small problems are adding up to this big problem or making it worse? How will solving one problem affect the others?

You then copy these questions to your Question Notepad, answer them, and refer to the IdeaBank to associate on new ideas. While the canned scripts are far too lengthy to complete and are often too generalized, they're effective as a guide to thinking about the details of the issue. Whether you use the predesigned scripts or create your own, the results are only as good as the information you supply.

RECURRING THEMES

The Key Concepts window records recurring words or ideas that are directly related to your answers to QBank questions. You can set the Key Concepts filter for the number of occurrences from 1 to 99. If "magazine" comes up five times, then it becomes a Key Concept. You can also mark with brackets any word or idea you want to define as a Key Concept. After the program identifies a Key Concept, you can copy it into the Idea Notepad and save it for further brainstorming in the IdeaBank. It's a process of discovery to help you flesh out the big picture. You get

BREAKING THROUGH WRITER'S BLOCK

by Greg Pastrick

For the last two weeks you've been trying to write that speech; you've been stalling, waiting for that bright idea to strike you, searching for words that flow with eloquence and ease, and now you've got only two days left. If this situation sounds familiar, you'll find that brainstorming can help you identify and organize your thoughts, ideas, and concepts. *Thoughtline*, \$195 from Xpercom, and the *Brainstormer* add-in found in Addison-Wesley's \$189 *Wordbench* are two writing tools that use proven brainstorming techniques.

The *Brainstormer* add-in is a straight-up writer's block solution. It uses four techniques to jump-start stalled writing: Freewriting, Invisible Writing, Nutshelling, and Goal Setting. Freewriting forces the uninhibited flow of words to screen for a timed interval of 30 seconds to 10 minutes. Stop typing, and the program prompts you to keep writing. The point is to get going now and worry about revising later. Invisible Writing encourages you to get thoughts and ideas into words by hiding text so that you don't focus on what you've already entered. As in Freewriting, you can go back and edit later.

Nutshelling accepts only eight text lines of 63 characters each, forcing you to state the purpose and subject of the writing task at hand. Goal Setting prompts you to define the subject, point of view, audience, and purpose of the writing session in a maximum of two lines each.

You can view and edit all the work you enter in *Brainstormer* only from the main application—*Wordbench*—or you can print it directly from the add-in itself.

THOUGHTLINE

Thoughtline is a speech writer's tool. It guides you through 16 structured question groups, all directed at creating a detailed outline for a speech. *Thoughtline* prompts you through four main categories: background, structure, development, and summary. *Background* covers goals, audience profile, personal interest, and audience interest. *Structure* probes thesis, opening, and key points. *Development* covers supporting evidence, new information needed, and supporting materials. And *summary* encourages you to think more creatively about the presentation of your thoughts and ideas. Strict as a little martinet, *Thoughtline* doesn't let you get away with skipping questions. Try it and you'll get responses like "Stop that."

***Thoughtline*, Version 2.1**, Xpercom, 3605 Luallen St., Carrollton, TX 75007; 800-678-7008, 214-492-8530. **List Price:** \$195. **Requires:** 640K RAM, DOS 3.1 or later.

CIRCLE 407 ON READER SERVICE CARD

***Wordbench*, Version 1.2**, Addison-Wesley Publishing Co., Route 128, Reading, MA 01867; 617-944-3700. **List Price:** \$189. **Requires:** 256K RAM, DOS 2.0 or later.

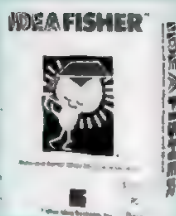
CIRCLE 408 ON READER SERVICE CARD

FACT FILE

EDITORS' CHOICE

IdeaFisher, Version 3.1
Fisher Idea Systems Inc., 18881 Von Karman Ave., Irvine, CA 92715; 800-289-4332, 714-474-8111. **List Price:** \$595 **Requires:** 512K RAM, DOS 3.0 or later. Mouse recommended.

In Short: *IdeaFisher* is a program with massive proportions and potential. It's a powerful tool designed to facilitate the process of making connections between words and phrases and developing creative ideas and concepts.



CIRCLE 410 ON READER SERVICE CARD

the best results from your effort by identifying Key Concepts, which you can characterize as bait in the sport of idea fishing.

Clearly, there are several approaches to *IdeaFisher*, and there are numerous ways to get lost in free association tangents and end up in levels far removed from where you started. Alternating between the four working screens and five IdeaBank screens can be a disorienting vision of cascading windows. Though the software is free-form enough to adapt to your own style of brainstorming, it's wise to follow a structured course through the massive database. For most applications, you can skip the QBank and head directly to the IdeaBank and Idea Notepad.

In the Version 3.1 upgrade, which is free to registered users, Fisher Idea Systems has added more window control by limiting the maximum number of open IdeaBank windows to five (down from a cluttered nine); a cut-and-paste clipboard; and the Association Librarian, which recommends where to best link and add personal associations you add to the IdeaBank categories and word lists. And you can now export IdeaBank and QBank reports as ASCII files for fine-tuning, editing, and integration into other applications.

A product of the 1960s, *IdeaFisher* was ported to the PC and Macintosh platforms in the 1980s and remains a truly unique software application. There's nothing out on the market quite like it, and it's

backed by people with a clear vision of the PC's supportive role in the creative process. While it consumes disk space and can be frustrating, *IdeaFisher* is a powerful brainstorming tool. You'll need to spend some time with the program before you achieve focused hits on your problem-solving targets, but it holds the potential to sharpen your creative edge.

The Idea Generator Plus

Problem solving through structured thinking is the philosophy at work behind *The Idea Generator Plus*. The package pushes you to examine a problem from all angles by responding to a set of routine questions and by building a personal database of your ideas. Considering the cost of creative workshops, training, and consulting sessions, this \$195 mind workout from Experience in Software is a bargain.

At the heart of *The Idea Generator Plus* is a series of idea-development exercises that focuses on accurately defining your problem and identifying your goals

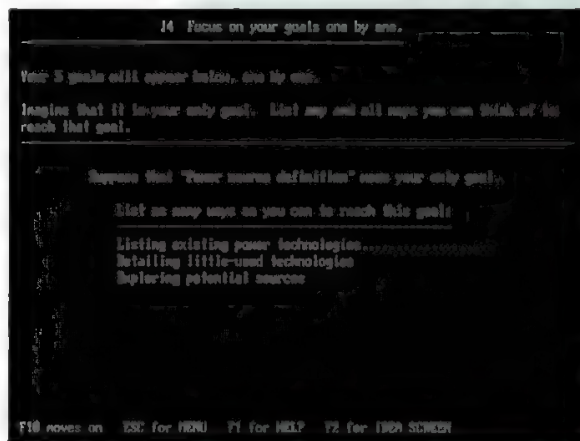
up front. It's based on a narrative approach to brainstorming, in which you do all the thinking and record your inspirations on a notepad as you go. *The Idea Generator Plus* also accounts for the people involved in or affected by your decisions, and in doing so departs from the path taken by *Brainstormer* and *IdeaFisher*. This unique perspective can prove helpful, especially if you find that the types of problems you resolve invariably involve people.

SIMPLE AND DIRECT

The Idea Generator Plus is a simple and direct package based on four main menu options that outline groups of open-ended questions. Your responses to the structured questions are

automatically reported to a notepad. The first, the Problem Statement exercise, asks you to define the brainstorming task. You respond to three open-ended questions: a description of the situation, your goals, and the people involved.

The second main menu item is Idea Generation, incorporating seven idea-development exercises. *The Idea Generator Plus* displays the first area of exploration, which prompts you to list similar situations drawn from your own experience. The next exercise asks you to come up with metaphors for the problem or task. In another, you explore other perspectives. Other routines ask you to define goals, to consider goal reversal, and to examine the people involved. There's also a work screen to fine-tune and prioritize ideas and a useful cost/benefit analysis session.

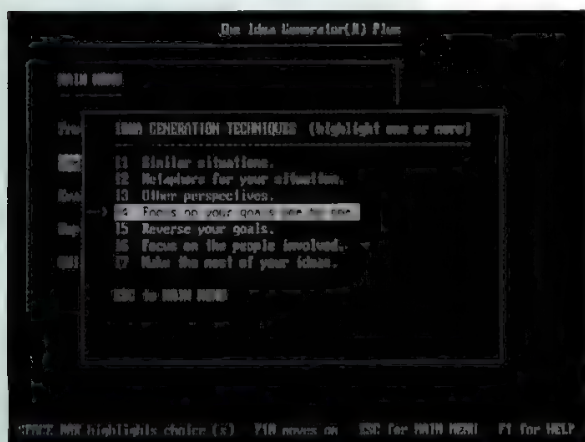


This screen shows examples of the focused language used throughout *The Idea Generator Plus*. In this example, a routine has been activated that forces you to explore all your defined goals individually.

The Idea Generator Plus provides examples to start you off. For instance, a metaphor for "unemployment" could be "a house to build." Or if the situation is "choosing a new career," the metaphor could be "planning a trip." The program then asks you to describe similarities between the two and to plan your course of action. What are your marketable skills? How do you like to travel? Where would you like to go?

You can consult examples of situations and possible metaphors on-screen. Another exercise helps you to focus on your goals one by one.

The Idea Generator Plus has a highly structured sequential approach to brainstorming. This menu screen shows the seven idea-generating routines that prompt you with pointed questions.



responses to the structured questions are

Add HP NewWave to Windows and what do you get? Simply a breakthrough.



Windows 3.0 is a great step forward. It just doesn't go far enough. You still have to overcome barriers you thought you'd left behind. Such as DOS. The complexities of file management and application integration. And working in two environments.

The solution? Simply add HP NewWave. In this one simple step, you turn your PC into the most powerful, easiest-to-use information tool in business. To prove it, we've put an eye-opening, interactive demonstration on disk.

It shows how NewWave's simple object model lets you work on one

desktop environment, instead of having to use both the Program and File Managers. You don't have to understand the DOS file system at all. And it works with the Windows applications you already have.

Integrating NewWave applications is astoundingly simple. Just drag and drop. "Drill down" editing lets you make changes in part of a document, such as a chart, without leaving it. And with "hot links," your data changes automatically in all connected files.

To evaluate NewWave, call (408) 376-2727 for your interactive demonstration disk. (Handling charge \$3.95.) Then experience one of the most dramatic breakthroughs ever brought to your screen.



**HEWLETT
PACKARD**

SOFTWARE BRAINSTORMING SOFTWARE

PC FACT FILE

The Idea Generator Plus, Version 3.1

Experience in Software Inc., 2000 Hearst Ave., #202, Berkeley, CA 94709; 800-678-7008, 415-644-0694. List Price: \$195.

Requires: 256K RAM, DOS 3.0 or later.

In Short: A clean, highly structured approach to problem solving and brainstorming marks *The Idea Generator Plus*. The program is well-connected to alternative applications for fine-tuning the ideas and concepts generated in its sessions.

CIRCLE #11 ON READER SERVICE CARD

EXPLORING NEW ANGLES

The exercise that examines other perspectives asks you to take on different voices. What would an optimist, pessimist, realist, dreamer, or parent say about your situation? *The Idea Generator's* exercise asking you to reverse your goals would force you, in the above example, to examine the opposites of "employment" or "rewarding job."

In the exercise that focuses on people who are involved in your problem or situ-

ation, you consider who may support or undermine your solutions. Exploring alternative viewpoints is one of the more valuable routines, and it will prompt you to imagine the positions and perspectives of mentors or valued advisers. Making the most of your ideas, the last of the seven exercises, asks you to list other ideas that may have occurred to you along the way.

The third main menu item is Evaluation, which asks you to rate and prioritize ideas. Then the Reports section of the package provides a summary of your session and presents file-transfer functions. You can write memos stating your situation, evaluation, and goals, and request input from people you list for distribution. You can also export the product of your labor to a selection of decision-making software, outliners, and PIMs, including *BestChoice 3*, *Decision Pad*, *GrandView*, *IBM Current*, *Lotus Agenda*, *MaxThink*, *PC Outline*, *Ready!*, *SideKick Plus*, and *Think Tank*. An editable .PIF file is included for running the software under *Microsoft Windows 3.0*.

The Idea Generator Plus references its

The Idea Generator Plus

SUITABILITY TO TASK

Problem definition				
Goal setting				
Free-form creativity				
Outcome evaluation				
Result reporting				

techniques to chapters in *The Art of Creative Thinking* by Gerard I. Nierenberg, but you don't need the book to follow the logic of the techniques. The package's idea-generation routines flow from the premise that looking at situations and problems from different angles leads to creative solutions. *The Idea Generator Plus's* approach is rigid, but it can lead to useful results, and the links it has to information-messaging applications offer the freedom to break loose from the package's highly structured environment. ■

Greg Pastrick is a Massachusetts-based free-lance writer and a frequent contributor to PC Magazine.

MODEL 24 high performance DATA EXCHANGE SYSTEM



Engineered
for speed,
flexibility
and
expandability

BayTech

Bay Technical Associates, Inc. Data Communications Products Division
200 N. Second St. Bay Saint Louis, MS 39520 USA
FAX: 601-667-4551, Telephone 601-667-8231 or toll-free
800-523-2702

CHECK THE SPECS

The Data Exchange System Model 24 allows high speed exchange of data between computers, printers and other peripherals.

- Powerful 16-bit CPL plus multiple high performance I/O processors allow super high speed transfer of data demanded by new faster computers and software.

- Optimum flexibility. Select the right combination of serial and parallel ports, and set any of these ports as a peripheral port or as a computer port.

- Basic unit expandable to 24 ports by 4-port modules offered in serial, parallel combinations.
- Standard 312KB buffer expandable to 4M megabytes to handle big print plot jobs and many small ones.

- Buffer memory dynamically allocated to maximize buffer utilization.

- Simultaneous data input and output on all ports, so no devices are kept waiting.

- Computer-to-computer communications concurrent with all other operations.

- Full duplex communication allows file transfer capability with many communications software packages.

- Compatible with virtually all computers, printers, plotters, modems and other peripherals.

- Pop-up RAM resident PC support software allows peripheral selection via hot key.

- Super fast throughput allows data to pass through with no apparent processing delays.

- Many user-definable parameters including separate baud rates, flow control and parity for each port.

- Internal serial-to-parallel and parallel-to-serial conversion.

- Unlimited hotline tech support.

- Designed and manufactured in the U.S.A.

Play It Again...Sam.

Don't allow your excellent review to fade away like a golden oldie. Ziff-Davis can print custom-designed article reprints* to keep your product at the top of the hit parade. Call today for information: Jennifer Locke, Reprints Manager 212-503-5447.

*minimum quantity 500; 3 to 4 weeks delivery.



Introduce yourself to an Acer reseller and you'll meet more than an expert in computer solutions. You'll meet the only person who can sell you three different 486SX computers today.

intel
486 SX™

You'll find out how the new Intel®486™ SX™ chip will change the way you do business, dramatically increasing your productivity for a very affordable price.

You'll get to know America's only full line of 486SX computers. The elegant **AcerPower 486SX** ISA desktop, upgradeable to 33MHz. The **AcerPower 486SX/E** EISA desktop, upgradeable to 33MHz or 50MHz for sophisticated graphics, image processing, and database applications. And the **AcerFrame1000** EISA tower, upgradeable to 33MHz or 50MHz for the most demanding server environment.

But even better than the exclusive 486SX family, you'll meet someone who can listen to your needs, configure solutions to fit your business and your budget, get you up and running, and follow-up with round-the-clock service and support.

Yes, we're proud of our 486SX products. But we're even prouder of our partnerships with our customers. Call **1-800-SEE-ACER** for a test run today.

MEET THE ONLY PERSON IN AMERICA WITH THREE 486TMSXTM COMPUTERS.



Acer 

©1991 Acer America Corporation
Acer and the Acer logo are registered trademarks of Acer America Corporation.
Intel is a registered trademark of Intel Corporation. 486 and SX are trademarks of Intel Corporation.

CIRCLE 519 ON READER SERVICE CARD

Your Global Partner in Computing

Soft letter

First Quartile

[illegible]

Printed with HP
LaserJet.³



- **Exploit HP and PostScript® laser printing power.** Print any fonts you have, anywhere you want them.
- **ZOOM in on the fine print.** Refine layout details with the help of on-screen WYSIWYG preview.
- **Pre-process totals to print them in headings, compute %-of-totals, sort and query with totals, and more.**
- **Use dBASE III®, III Plus®, IV,™ Clipper®, Quicksilver®, dBXL®, FoxBASE+,® FoxPro.™** Index support is built-in.

Call 800-325-9035 to order, or for more information and dealer names.

R&R Report Writer

The award-winning family of R&R Report Writers includes versions for dBASE, ORACLE® SQL, Novell NetWare SQL, XDB-SQL, Lotus 1-2-3® and Symphony.®



CIRCLE 315 ON READER SERVICE CARD

by
Luisa Simone

Lab Notes

To state it bluntly, PostScript has become the de facto standard of the electronic publishing industry.

There are still alternatives, of course. Before the advent of Adobe PostScript, the electronic publishing industry got along very well, thank you, using minicomputers and proprietary software with professional-level systems like Atex and Scitex to generate high-resolution documents on Linotronic and AGFA Compugraphic equipment. These systems won't go away overnight. But in the long run they cannot compete with the broadening user base and increasing technical power of PC-based systems.

PostScript revolutionized the industry by making it possible to create many of the same documents that the professional systems produced, at the same quality level, on the same high-resolution output devices, using an off-the-shelf, low-cost personal computer.

While it generated a lot of excitement, however, PostScript's 1985 debut as an integral part of the Apple LaserWriter created a fair amount of confusion. Many people assumed that PostScript was part and parcel of a Macintosh system. Steven Jobs may have thought of the PostScript-driven Apple LaserWriter as a Mac-only peripheral. But John Warnock and Charles Geschke—Adobe's founders and PostScript's creators—had a far more encompassing vision, and it was only a short time before IBM PCs were driving PostScript-capable laser printers.

PostScript's ability to migrate easily from the Mac to the PC—or indeed to any other platform—is explained by one fact: PostScript is inherently a device-independent Page Description Language (PDL). While most PC programs send a finished bitmapped image directly to the printer, what PostScript-capable applications do instead is to generate an intermediate set of instructions, or code. The PostScript interpreter, stored in the printer's ROM, translates the routines into the final, necessary, printable bitmap.

A Guide to PostScript For Non-PostScript Programmers

■ If you understand the basics of its Page Description Language, you can troubleshoot and modify PostScript code with only your word processor.

Bitmapped images consist of a fixed number of dots arranged in a series or matrix. In the case of monochrome printer files, black dots can be either *on*, which means they will print, or *off*, which means the white of the paper will show. However, the number of dots never changes. When you output a 6-inch-square, 300-dot-per-inch image on a 600-dpi printer, the file's fixed resolution cannot take advantage of the increased capabilities of the output device. If you do print at the higher resolution, the image will be only 3 inches square, because twice as many dots can fit into a square inch.

PostScript files, however, are vector files; they contain a list of instructions that an output device can interpret to produce an image. Since a description of a line, a square, or a circle has no intrinsic resolution, PostScript files are device- and resolution-independent.

As you can see in Figure 1, a PostScript driver, which is part of the application program (or part of the graphical operating system in the case of *Microsoft Windows*), actually writes only code. The PostScript file you generate from *PageMaker*, *Corel-*

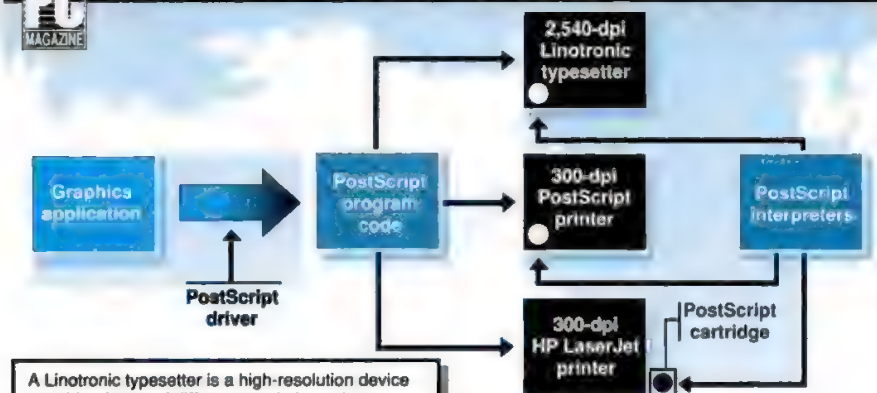
DRAW, or *Micrografx Designer* is not a bitmapped representation of anything; it is uncompiled program code. The bitmap itself is created locally by the printing device.

The beauty of this system is that the intermediate code is independent both of the host system that created it and the ultimate output device. Indeed, though PostScript contains elements common to all languages (variables, loops, conditionals, and operators), and though many of its commands are graphics-specific (*moveto*, *lineto*, *arc*, and *scale*), there is rarely an instruction in a PostScript file that pertains to resolution. That's because the PostScript interpreter in the printer (which is also called a *RIP*, for Raster Image Processor) always assumes that it should output the vector instructions at the highest possible resolution. It is this important aspect of the PostScript language that allows users to print out the same file on a 300-dpi laser printer or on a 2,540-dpi Linotronic typesetter.

It's instructive to contrast this approach with Hewlett-Packard's Printer Control Language (PCL). PCL has evolved in stages from a very simple language for line printers into its current (fifth) version, which contains sophisticated vector-based commands for imaging a page. The PCL 5 code itself can nevertheless be imaged directly *only* at 300 dpi—not coincidentally, the resolution of the HP LaserJet family of printers.

(In fairness, there is a workaround for printing out a PCL file at higher resolutions. The scheme involves scaling the im-

HOW A POSTSCRIPT IMAGE IS OUTPUT



A Linotronic typesetter is a high-resolution device capable of several different resolutions; the two most common in the commercial printing field are 1,270 and 2,540 dots per inch. Linotype (the maker of Linotronic typesetters) has a PostScript interpreter or RIP (raster image processor) that converts PostScript code into the highest-resolution image the typesetter is capable of.

A typical PostScript printer, such as the Apple LaserWriter, is capable of only 300 dpi. For the purposes of this article, that's the only difference between a PostScript laser printer and a high-resolution typesetting device.

The cartridge currently in use with HP printers contains an interpreter. It can either translate from PostScript to HP's Printer Control Language (which then is imaged normally as though it were an HP file), or it can take over the printer engine, sending a fully processed bitmap file to the engine.

Figure 1: The secret of PostScript's flexibility is that applications generate an editable intermediate code that is turned into a final bitmap by an interpreter located in the printing device.

preters come in all forms and at all prices.

You can add PostScript functionality to your tried-and-true HP LaserJet by purchasing expansion cards, cartridges, or software-only clone interpreters. Representative examples are the \$2,500 Princeton Publishing Labs PS-388, the \$495 PacificPage from Pacific Data Products, and the \$445 QMS UltraScript PC Plus.

In large measure, the very success of the clone products is proof of PostScript's robust nature. However, their presence does increase the complexity of life in the PostScript age. Though it might be technically incorrect to label differences between Adobe PostScript and its imitators as incompatibilities (since they are deliberate changes), some clones substitute segmented curves for beziers, some choke on certain pattern-fill commands, and most can't handle true Adobe Type 1 fonts.

A much more basic issue is raised by the fact that in the five years since PostScript was introduced, there have been several extensions to the language. Some major extensions: the addition of a CMYK (cyan, yellow, magenta, and black) color model, which is essential for commercial printing processes; composite fonts that support very large character sets (the Japanese kanji, katakana, and hiragan alphabets, for example); and Display PostScript, which provides a device-independent imaging model for managing the appearance of monitors. The problem is that there is no way to tell whether clone

manufacturers have updated their code in step with Adobe.

The recent announcement of PostScript, Level 2, promises to focus attention on the problem. PostScript, Level 2, incorporates all three of the extensions noted above, while adding several new commands as well. Level 2 products should hit the market early in 1991, and for at least the next year, both Level 1 and Level 2 products will continue to be introduced independently of one another. Adobe's assurance that any file written by a Level 1 driver will be imaged perfectly by a Level 2 interpreter doesn't guarantee the reverse. In some cases files written by Level 2 drivers will *not* be backward-compatible with Level 1 interpreters.

To this already heady mix of potential conflicts, you must add the uneven performance of PostScript drivers. Until the release of *Windows 3.0*, for example, Microsoft's own driver (released for *Windows 2.x* as an official driver for Adobe PostScript) printed any color information in a PostScript file as shades of gray. Not so good if you were connected to a color PostScript printer.

In most cases, however, PostScript files will continue to print without a hitch, thanks to the extreme flexibility and stability of the language. The minitutorial that follows will help you get at least a feel for that language. It's not meant to turn you into a PostScript programmer overnight. But with some very basic understanding of PostScript, you can troubleshoot or at least identify many of the problems you may encounter. As you go through the examples presented here, you'll learn how to print .EPS files directly from DOS, fix incorrect or incomplete header information, rotate text for a photo credit, and proof color scanned images on early noncolor PostScript interpreters.

The PostScript Page Description Language uses vector-based instructions (rather than a bitmap) to express the way images will appear on a page. The instructions can relate to text, lines, objects, coordinates, and can even include scanned bitmaps. A PostScript program file can be stored in binary or ASCII format—the latter being the most common. In fact you can use a standard ASCII word processor to view, and even alter, the code in a PostScript file.

HANDS ON THE HEADER

Because you can bring it up as an ASCII file, the best way to start is by looking at a

age at twice or three times the normal size and then printing out at a resolution that is a multiple of 300. A twice-normal-size image can be printed out on a 600-dpi printer, a four times normal size image can be printed out at 1,200 dpi. It isn't elegant, but it does work.)

Thanks to new charting, drawing, and DTP programs, chances are that you're already working with PostScript files in some form. You don't need to learn how to read a single line of PostScript code in order to do so. However, given the increasing market presence of PostScript clones, the varying quality of PostScript drivers, and Adobe's own June 1990 announcement of a new version of the language (see the sidebar "PostScript, Level 2"), learning about PostScript may be of more than academic interest. It may be a matter of old-fashioned job security.

Adobe's official list of OEMs and licensees is extensive. It includes front-line companies like IBM, Apple, NEC, Ricoh, and Fujitsu. There are, however, laser printers on the market (for example, the \$7,995 Tektronix Phaser PX) that use a cloned version of Adobe PostScript instead of a licensed one. And clone inter-

Lab Notes

real PostScript program, such as the Encapsulated PostScript file, which is shown in Figure 2a.

Encapsulated PostScript files are a subset of the PostScript language. .EPS files were developed so that PostScript images could be embedded into other documents—like a *PageMaker* newsletter.

There are only two basic differences between an .EPS file and the standard PostScript language files you can send to your

printer: an .EPS file is limited to a single-page document; and just to be sure that all PostScript applications can import and print from them, .EPS files must be well-behaved.

A well-behaved .EPS file must adhere strictly to the PostScript structuring conventions of incorporating a header, a prologue, and a script. You'll recognize the header both because it's the first thing you encounter and because every line in it is preceded by a percent sign (%). This is a signal that these lines contain identifying information that should not be interpreted as part of the image.

Figure 2a demonstrates the type of information that should be included in the header, such as creation date and title. The importing application, such as *PageMaker*, looks for the percent sign followed by an exclamation point (%!). This identifies the file as Encapsulated PostScript code.

The importing application then uses the other information in the header to display the image on-screen. This sample display is extremely simple, consisting of a gray box, created from the Bounding Box comment, together with some tag lines picked up from the Creator and Title entries.

POSTSCRIPT, LEVEL 2

by Luisa Simone

In June of 1990, Adobe Systems announced a major upgrade to the PostScript page description language. In many ways, PostScript, Level 2, is more than Adobe's response to the needs of its customers and OEMs. It also represents a preemptive strike against Microsoft's as-yet-unreleased TrueImage technology. Some of the features in Level 2 will improve performance or increase the flexibility of the PostScript language. However, PostScript, Level 2, also attempts to bring new power to the PC desktop by establishing higher standards for imaging text and graphics.

PostScript, Level 2, introduces what may become yet another industry standard by providing a device-independent color model. Scanned full-color images—and the consequent need for color separations—are becoming commonplace in the PC graphics arena. The original PostScript had operators that understood RGB color only. The Adobe Color Extension specification brought the 32-bit CYMK model—a system essential to commercial printing processes—to the PC. Level 2 builds upon this by incorporating both RGB and CYMK systems into the basic code and by adopting an umbrella system—the CIE 1931 (XYZ) color space—that can be used to translate between the two.

The CIE (*Commission Internationale de L'Eclairage*) standard is based upon human perception itself. As such, it is a device-independent color

model—unless you consider the human eye to be a device. If equipment manufacturers can find a way to calibrate the phosphors in monitors and the toner in printers to the CIE color model, we can have a color-matching system that will be consistent across all types and makes of hardware.

In addition, while the Composite Fonts extension made it possible to handle complex character sets (such as the 7,000-plus characters of the Japanese alphabets), PostScript, Level 2, makes it easier to issue font commands for all languages. The new `selectfont` operator can replace multiple operators like `findfont`, `scalefont`, and `setfont` that were necessary in Level 1 code.

Another highlight of Level 2 is its support of graphics compression routines such as CCITT, LZW, DCT, and JPEG. This should speed up performance when printing bitmapped photographic images—an important consideration if you pay for time on a Linotronic typesetter. Similarly, new combination operators such as `rectfill` (which draws a filled rectangle), should increase PostScript's speed, because the Level 2 interpreter can translate one command in place of what used to require a command sequence such as `moveto`, `lineto`, `lineto`, `lineto`, `closepath`, `fill`.

Type quality has also been improved by incorporating much of the font-rendering technology developed for Adobe Type Manager. You will still have to buy the ATM software product

in order to see accurate on-screen representations of Type 1 fonts or to bring Type 1 fonts to your non-PostScript printer. However, Level 2 PostScript will give you cleaner, more-precise letterforms at small point sizes, and it will also reduce the time needed to render the specified point size from the outline font. Since speed—or the lack of it—has traditionally been the biggest complaint about PostScript's performance on text-intensive pages, this last item is good news for DTP aficionados.

As a matter of fact, the only bad news about Level 2 PostScript is that in some instances it may not be backward-compatible with Level 1 interpreters. Adobe admits that the migration to Level 2 among its OEMs may take up to 18 months. In this interim, some products that will be compatible with Level 1 and some with Level 2 will be coming to market.

Adobe's partial solution will be to develop smart PostScript drivers for the Mac, Windows 3.0, and Presentation Manager environments. Hopefully, these drivers will create an either/or scenario. That's to say, either the new, more-efficient operators will be executed or the prologue will redefine the new command using older, definitely compatible Level 1 operators.

The original philosophy behind the PostScript language was to sacrifice speed, if necessary, in favor of functionality. Level 2 PostScript promises to give users both kinds of high performance—a high-quality printout and record time. ■

Technical support at 3 a.m.
is just one reason why...



Northgate® makes it safe to buy business computers direct.

A 24-hour business hotline service for your 24-hour business. Many companies don't realize the importance of 'round the clock technical support ... until they need it. But, chances are, you or someone you know has had questions about computing after normal office hours. If you purchased your systems from one of our competitors, you probably had to wait to get help. Time-wasting. Inefficient. Costly.

Northgate treats you right! Across town or around the world, Northgate's business customers have a special hotline that gives immediate 24-hour access to Northgate's team of technical experts. Compare this with our competitors. Many have limited hours (like 9 a.m. to 2 p.m. on Saturdays; closed Sundays), some won't answer the phone during lunch hour and close up shop at night. While others offer little or no support at all.

Northgate's commitment to customer service and support caught the attention of the 1990 Microcomputer Marketing Council who selected Northgate as the first winner of the Association's Service and Support Award. When you buy from Northgate, rest assured we're here to serve you—in person—all day, every day. And the call's always on us.

From our spectacular SlimLine 386SX to our powerful Elegance 486™ file servers, Northgate backs them all with quality in every respect.

Industry's highest performing systems. In an industry overflowing with companies all claiming top performance, only one company is consistently ahead of the pack: Northgate. Since January of 1989 when our first *PC Magazine* Editor's

choice was awarded, our name has become synonymous with pace setting performance. Seven Editors' Choice awards, eight *Computer Shopper* "Best Buy" Awards and three *InfoWorld* recognitions are proof.

Quality systems through manufacturing and testing. As a manufacturer, Northgate does not subscribe to the industry trend of taking shortcuts in technology to boost performance gains and keep prices down. Rather, we thoroughly test components for compatibility, performance and value. In fact, if you were to order a hundred of our machines with the same configuration, every one would have the exact same performance. From hard drives all the way to our ALPS keyboard switches. And every stop in between. No "parts of the month" surprises or compatibility problems. We stake our reputation on it.

Unparalleled compatibility with your current industry standard systems and software. One of our competitors recently announced they set up an "FCC Testing Lab." At Northgate, this is nothing new. For years, Northgate has gone the extra step to ensure that our systems are FCC Class B certified. And, we've invested hundreds of thousands of dollars to make sure our systems are compatible with MS-DOS, OS/2, Novell®, Banyan, UNIX, SCO and other software. It's no wonder why many major software developers use Northgate to design, develop and "debug" their new software.

Dollar for dollar, Northgate is your smartest business decision. No doubt you can pay less for computers. And you can certainly pay more. But you won't get the product, performance, service and support

that has positioned Northgate as the new industry leader. No matter what the price, you just can't buy better than Northgate.



Free pre-purchase consultation. Nobody spends thousands of dollars on systems during the first phone call. You know it, we know it. Instead, we offer a no-obligation pre-purchase consultation with one of our highly-trained Technical Consultants. You won't get high-pressure tactics or commission-hungry salespeople. Just friendly assistance in matching your business needs with the appropriate Northgate solution.

**CALL TOLL-FREE
800-828-6125**

IN U.S.A. AND CANADA

Major corporations, volume purchasers and government agencies call
National Business Accounts: **800-548-3510**

Notice to the hearing impaired:
Northgate has TDD capability. Dial 800-535-0602.



"Smart Tools For Business"™

7075 Flying Cloud Drive,
Eden Prairie, Minnesota 55344

Magazine said it best...
Northgate stops at nothing to please its customers!™

Call Northgate® Now.

**Northgate
Exclusive!**
Edsun CEG Chip
available with
SlimLine
386/33!



Award-winning performance, unequalled service and incredible support for a price IBM®, Compaq® and Dell® can't hope to match.

The power of 386™ computing is the lifeblood of business today. And more and more, Northgate is the vendor of choice. Why? Northgate is the only company who consistently earns top ratings for performance, service, support and bottom-line value. Industry experts and users worldwide agree.

Northgate 386 ... computing's most decorated line. Northgate's rise to the pinnacle of 386 technology started in 1988 when *Computer Shopper* readers voted Northgate's 386 Power System both a "Best Buy" and Overall Best Buy. A few months later, *PC Magazine* named Northgate 386/20 and 386/25 "Editors' Choice." Later that year, our 386/33 received the same honor. Along the way, our 386 systems won several *InfoWorld* recognitions as well.

Revolutionary systems of the 90's: Northgate SlimLine.™

Often copied, never duplicated! It seems like everyone has jumped on the SlimLine bandwagon these days. Truth is, Northgate pioneered this incredible technology. We were the first to introduce full power 386 systems in a case measuring only 4.25" high.

Architecture that stunned the industry! SlimLine's fully-integrated motherboard features built-in IDE hard drive and floppy drive controllers, one parallel and two serial ports plus a 16-bit VGA controller. And we didn't scrimp on expansion capabilities. Our unique expansion tree has three full-length 16-bit and two half-length 8-bit slots for all your add-ons and peripherals.

Perfect single-user workstation or network terminal. SlimLine is ideal for use where you need full-size 386 power, but space is a premium.

For comprehensive system features and popular configurations, see next page.

Northgate Elegance™: Full-size 386 power and expandability.

The business systems of choice. Elegance's award-winning reputation has made them the choice of Fortune 1000 corporations, government agencies and universities around the world. And with good reason.

Elegance full-size systems are designed to allow you to easily expand your system as your business needs increase. You only pay for the components you need now.

Power for every application. From "simple" tasks like word processing and desktop publishing to advanced CAD/CAE and database management applications, Elegance delivers. To find out what systems are right for you, see next page for system configurations and upgrade options.

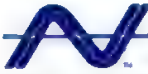
Northgate wins 1990 Micro-computer Marketing Council's Service and Support Award!

- 30-day no-risk trial period
- Full one year warranty on systems, 5 years on OmniKey keyboards.
- Northgate responds to your needs with overnight shipment of parts—at our expense!
- Free on-site service to most locations for one year if we can't solve your needs over the phone.
- Unique 24-hour toll-free technical support—the industry's best!
- We accept VISA, MasterCard, Discover and Northgate's Big 'N' card. We offer leasing and financing options, too!

Free pre-purchase consultation. Nobody spends thousands of dollars on systems during the first phone call. You know it, we know it. Instead, we offer a no-obligation pre-purchase consultation with one of our highly-trained Technical Consultants. You won't get high-pressure tactics or commission-hungry salespeople. Just friendly assistance in matching your business needs with the appropriate Northgate solution.

CALL
TOLL-FREE **800-828-6125**
IN USA AND CANADA

Fortune 1000 corporations, government agencies and education institutions, call National Business Accounts: **800-548-3510**
Notice to the hearing impaired: Northgate has TDD capability. Dial 800-535-0602.

 **NORTHGATE
COMPUTER
SYSTEMS, INC.**
"Smart Tools For Business"™

7075 Flying Cloud Drive,
Eden Prairie, Minnesota 55344

Only Northgate® offers a full range of 386™ systems in SlimLine™, Desktop, and Vertical Power Cases!

SlimLine...a Northgate original!



SlimLine Features:

- Small footprint (16.5" square x 4.25" high) SlimLine case with room for two exposed and one internal half-height devices
- Intel® and Weitek math coprocessor support
- 150 watt power supply
- Clock/calendar chip rated at 5 years
- Front mounted reset and high/low speed controls
- MS-DOS 4.01 and GW-BASIC installed
- On-line user's guide to MS-DOS 4.01
- QA Plus Diagnostic and utility software
- FCC Class B certified

SlimLine 386SX/16 and 20 MHz with 64K Cache

- Intel 80386SX/16 or 20 MHz processor
- 2Mb of RAM on motherboard
- 40Mb hard drive
- 64K SRAM read/write-back cache
- 1.2Mb and 1.44Mb floppy drives
- 14" VGA color monitor
- OmniKey® keyboard

\$2399⁰⁰ / \$2599⁰⁰

Or as low as \$75⁰⁰/\$80⁰⁰ per month*

SlimLine 386/25 MHz with 64K Cache

- Intel 80386/25 MHz processor
- 4Mb of RAM on motherboard
- 100Mb hard drive
- 64K SRAM read/write-back cache
- 1.2Mb and 1.44Mb floppy drives
- 14" VGA color monitor
- OmniKey keyboard

\$3399⁰⁰

Or as low as \$105⁰⁰ per month*

SlimLine 386/33 MHz with 64K Cache

Exclusive! Now, the revolutionary Edsun CEG chip is available with SlimLine 386/33. This device emulates up to 2048 x 2048 resolution and lets your standard VGA monitor display an incredible 750,000 colors. Plus, it smooths out the jagged edges around images giving you clarity and brilliance you must see to believe! Call for pricing.

- Intel 80386/33 MHz processor
- 4Mb of RAM on motherboard
- 200Mb hard drive
- 64K SRAM read/write-back cache
- 1.2Mb and 1.44Mb floppy drives
- 14" VGA color monitor
- OmniKey keyboard

\$3899⁰⁰

Or as low as \$120⁰⁰ per month*

Editors' Choice—all Elegance™ systems

Elegance Features:

- 5-bay desktop case with room for 3 exposed and 2 internal half-height devices with 200 watt power supply.
- Optional 7-bay vertical power case has 220W power supply
- RAM expansion up to 8Mb on motherboard (16Mb total RAM with 32-bit memory card)
- 16-bit VGA video adaptor
- One parallel and two serial ports
- MS-DOS 4.01 and GW-BASIC installed
- FCC Class B and Novell certified



Northgate Elegance 386/25

- Intel 80386/25 MHz processor
- 4Mb of RAM
- 100Mb hard drive
- 64K SRAM read/write-back cache
- 1.44Mb and 1.2Mb floppy drives
- 16-bit VGA Adaptor
- Desktop case
- 14" VGA color monitor
- OmniKey keyboard
- Microsoft Windows and mouse

\$3699⁰⁰

Or as low as \$115⁰⁰ per month*

Northgate Elegance 386/33

- Intel 80386/33 MHz processor
- 4Mb of RAM
- 200Mb hard drive
- 64K SRAM read/write-back cache
- 1.44Mb and 1.2Mb floppy drives
- 16-bit VGA adaptor
- Vertical power case
- 14" VGA color monitor
- OmniKey keyboard
- Microsoft Windows and mouse

\$4449⁰⁰

Or as low as \$140⁰⁰ per month*

If one of these popular SlimLine or Elegance models doesn't meet your needs, CALL! We'll custom build one just for you!

CALL TOLL-FREE
800-828-6125

IN U.S.A. AND CANADA

Major corporations, volume purchasers and government agencies call
National Business Accounts: **800-548-3510**

Notice to the hearing impaired: Northgate has TDD capability. Dial 800-335-0602.



"Smart Tools For Business™"

7075 Flying Cloud Drive,
Eden Prairie, Minnesota 55344

Lab Notes

CREDIT.EPS and .PS

COMPLETE LISTING

Version (a): CREDIT.EPS

```
%!PS-Adobe EPSF
%%Title: Rotated Credit
%%Creator: GK
%%CreationDate: 9/27/1990
%%BoundingBox: -10 0 2 598
/r {rotate} def
```

```
% setgray
/Helvetica findfont 5 scalefont setfont
% moveto
% r
(ILLUSTRATION: LUISA SIMONE) show
-90 r
```

Version (b) CREDIT.PS

```
%!PS-Adobe EPSF
%%Title: Rotated Credit
%%Creator: GK
%%CreationDate: 9/27/1990
%%BoundingBox: -10 0 2 598
/r {rotate} def
/inch {72 mul} def
```

1 inch 1 inch translate

```
% setgray
/Helvetica findfont 5 scalefont setfont
% moveto
% r
(ILLUSTRATION: LUISA SIMONE) show
-90 r
```

showpage

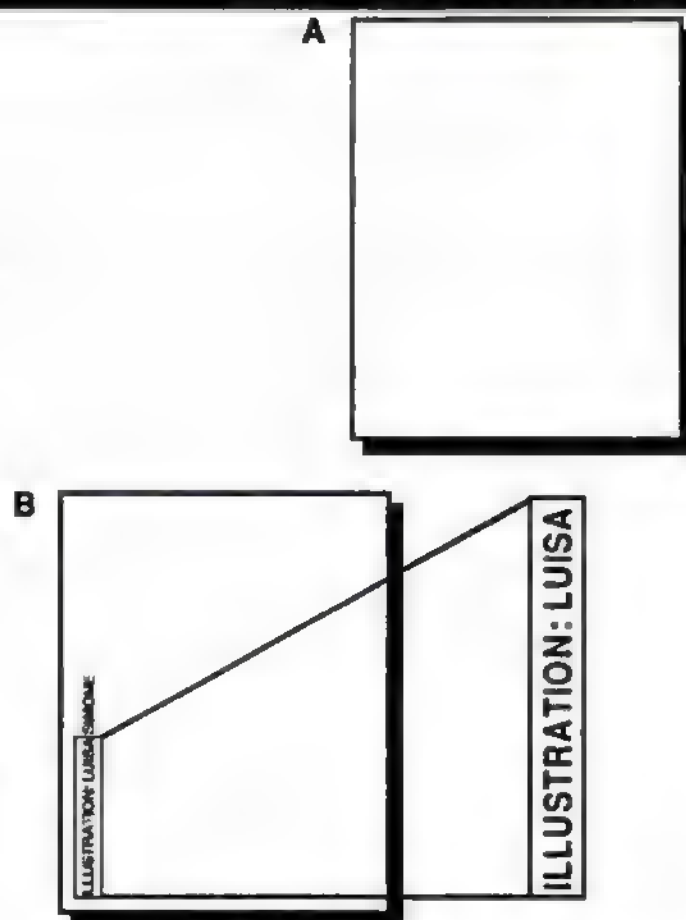


Figure 2: The 0,0 coordinates in version (a) place the output within the nonprinting border of the HP laser engine, thus the output is not visible. By using your word processor to make the slight modifications that turn version (a) into version (b) (where the output is visible), you can print an .EPS file on your PostScript printer with the DOS COPY command. (The output shown in this figure has been reduced for reasons of space.)

Think of the gray box—which is also called a bounding box—as a placeholder. The placeholder is necessary because Display PostScript doesn't exist on the PC platform. So there is no way for an importing application, such as *PageMaker*, to display a plain-vanilla .EPS file on-screen. The gray box is created from a Bounding Box comment in the file's header and tells the importing application the vertical and horizontal dimensions (or boundaries) of the .EPS file.

If for some reason the bounding box information is wrong, the EPS image will be clipped when it prints. Why, then, is it handled only as a comment? The answer is that by keeping the bounding box information as a comment, the importing application can stack up sizing commands in front of the .EPS file. That allows you to resize the image without loss of quality.

I tend to keep a lot of .EPS files, culled from different sources, on hand for testing and design. Customizing the header information is quite a simple matter. In the example shown here, the title of the file is "Rotated Credit," since that is what this program does. It prints a photo or illustration credit vertically—something, incidentally, that *PageMaker* 3.01 still can't do.

You might decide to title an .EPS file "Company Logo." You'll want to change the creator name (which is usually something totally useless, like Lotus Freelance) to the name of the person or department in your organization responsible for the data. In this example, the GK stands for Gerard Kunkel, *PC Magazine's* director of design and electronic publishing.

A word of warning: if you ever pull an .EPS file into your word processor and the %! identifier is *not* the first thing you see, you have probably opened an .EPS file with an attached TIFF header.

Think of an attached TIFF image as a kind of courtesy. Some programs attach this low-resolution bitmapped image onto an .EPS file so that you can see something more than just a gray bounding box on the screen. TIFF is a binary file format that does not get along well with ASCII-based word processors. Your options are either to abort the file, or—if you are determined to work with the PostScript code anyway—to delete any binary information that you see.

Though it's not absolutely necessary, having a *prologue* will in most cases improve the efficiency of a PostScript file. The prologue routines are identified by a slash (/). Basically, they are used to create new definitions that can, for example, combine a series of simple but related commands into one procedure. The power inherent in these on-the-fly definitions increases exponentially when you consider that you can include variables, employ looped expressions, and store the new routines in user-defined dictionaries.

THE IMPORTANCE OF PROLOGUES

Though the program in Figure 2a is really too simple to require a prologue, I included one anyway. Here I redefined the rotate command as r. Now whenever I type the newly defined r command, a rotation will occur.

Prologues can also be used by smart programmers—and smart drivers—to overcome some of the barriers between different versions of PostScript. Suppose, for example, that a PostScript Level 2 driver wanted to use one of the new combination commands, such as `rectfill`. This single command draws a filled rectangle and obviates the need to list six separate line and fill commands.

A Level 1 interpreter will not understand the `rectfill` instruction, of course, so it won't be able to print the file. A well-written prologue can save the day, however, by instructing the program to look for the command in the interpreter. If the command is not present, the prologue will simply redefine the `rectfill` instruction as the very series of simpler commands known to be part of Level 1 PostScript. In fact, Adobe is planning to write just such a smart driver for the Mac environment, as well as for *Windows* 3.0 and *Presentation Manager*.

READY, SET, SCRIPT
The actual commands are listed in the portion of the program known as the *script*. Commands built into the PostScript language are called *operators*. Even if you know nothing about the PostScript language, you'll recognize a fair number of its operators. Obviously, `moveto` is a command that goes to a specified x- and y-coordinate. `lineto`, `scalefont`, `findfont`, and `curveto` have similarly self-evident meanings.

The actual script of our sample .EPS file begins with a `setgray` command that establishes a zero (or black) value. The commands then simply run in a logical sequence.

The actual script of our sample .EPS file begins with a `setgray` command that establishes a zero (or black) value. The commands then simply run in a logical sequence.

Northgate 486™/25 & 33 MHz

486 ISA...486 EISA.

Only Northgate gives you a choice!



Number One! Elegance™ 486/25 & 33 MHz ISA



InfoWorld's Product of the Year! After outscoring the competition in InfoWorld's 1990 reviews, and being praised as "tops in support and value,"† Elegance

486/25i was awarded the publication's highest honor: Product of the Year. This was the fourth award given to an Elegance 486 system ... no other company comes close!

PC Magazine says "Editors' Choice!" When reviewing 486/25 systems, they said "Only one machine stands out ... you could pay less for a 486 system, but not get the bonuses that are offered with the Elegance."††



Elegance 486-25i, Sept. 11, 1990
Elegance 486-33i, Feb. 12, 1991

In the February 12, 1991 issue, PC Magazine declared Elegance 486/33 Editors' Choice, saying the system was "a sure winner in its class."



Computer Shopper readers agree! Elegance 486/25i breezed past the competition and captured a 1990 "Best Buy" award. This makes three years in a row, a Northgate Elegance system was voted

tops by Computer Shopper readers.

ISA 486 System Features:

- ♦ Intel 486/25 or 33 MHz processor
- ♦ 4Mb RAM; expandable to 8Mb on motherboard
- ♦ 200Mb IDE hard drive
- ♦ 1.2Mb and 1.44Mb floppy drives
- ♦ 64K SRAM read/write-back cache
- ♦ ISA bus
- ♦ One 32-bit, six 16-bit and one 8-bit slots
- ♦ One parallel and two serial ports
- ♦ Vertical "Power" case (desktop available)
- ♦ 16-bit VGA graphics adaptor with 512K video RAM (expandable to 1Mb)
- ♦ 14" SVGA color monitor
- ♦ OmniKey®/ULTRA keyboard
- ♦ MS-DOS 4.01 or 3.3 and GW-BASIC software installed
- ♦ Microsoft® Windows™ 3.0 and mouse
- ♦ FCC Class B Certified

\$5399⁰⁰ / \$6299⁰⁰
25 MHz / 33 MHz



486 EISA gives you full 32-bit performance!

Performance that rivals RISC-based minicomputers costing thousands more! New 32-bit EISA bus gives you the power to transfer data along your network at burst mode speeds up to 33 megabytes per second. That's a 15-fold improvement over 16-bit AT buses serving medium-to-large networks.

Complete compatibility! Elegance 486e is 100% compatible with UNIX, Novell® and DOS. Plus, Elegance is compatible with existing 8-bit and 16-bit ISA adapters, so you benefit from downward compatibility.

Compare Elegance 486e performance and Northgate service and support with any other vendor's in the industry. You'll find you can't buy better than Northgate! Call now ... let Northgate build your system today!

True EISA 486 System Features:

- ♦ Intel 486/25 or 33 MHz processor
- ♦ 4Mb RAM; expandable to 32Mb on motherboard
- ♦ 1Mb EISA caching SCSI controller
- ♦ 200Mb SCSI hard disk
- ♦ 1.2Mb and 1.44Mb floppy drives
- ♦ 128K SRAM read/write-back cache
- ♦ EISA bus
- ♦ Eight 32-bit EISA slots; six bus master and two slave
- ♦ One parallel and two serial ports
- ♦ 16-bit VGA graphics adaptor with 512K video RAM (expandable to 1Mb)
- ♦ 14" SVGA monochrome monitor
- ♦ Vertical "Power" case
- ♦ 300 watt power supply
- ♦ OmniKey®/ULTRA keyboard
- ♦ MS-DOS 4.01 or 3.3 and GW-BASIC software installed
- ♦ Microsoft mouse
- ♦ 25 MHz FCC Class B Certified (33 MHz FCC Class A)

8199⁰⁰ / \$9199⁰⁰
25 MHz / 33 MHz

Northgate wins 1990 Microcomputer Marketing Council's Service and Support Award!

- ♦ **30 Day No-Risk Trial.** To assure your complete satisfaction, Northgate gives you a 30-day No-Risk Trial.
- ♦ **Full parts and labor warranties:** 1 year on systems; 5 years on OmniKey keyboards.
- ♦ **Overnight shipment of replacement parts when needed** — at our expense.
- ♦ **Northgate's unique 24-hour toll-free technical support** leads the industry — most needs are met with just one call!
- ♦ **Free on-site service** to most locations if we can't meet your technical needs over the phone.
- ♦ **Easy financing:** Use your Northgate Big 'N', VISA, MasterCard or Discover Card. Leasing terms up to five years also available.

Free Pre-purchase Consultation

Nobody spends thousands of dollars on systems during the first phone call. You know it, we know it. Instead, we offer a no-obligation pre-purchase consultation with one of our highly-trained Technical Consultants. You'll receive friendly assistance in matching your business needs with the appropriate Northgate solution.

**CALL TOLL-FREE
800-828-6125**

IN U.S.A. AND CANADA

Fortune 1000 corporations, government agencies and education institutions call National Business Accounts: **800-548-3510**

Notice to the hearing impaired: Northgate has TDD capability. Dial 800-535-0602.



"Smart Tools For Business™"

7075 Flying Cloud Drive, Eden Prairie, Minnesota 55344

Lab Notes

quence: find a font named Helvetica, scale it to 5 points, and set it. Then move to the lower-left corner of the bounding box (0,0), rotate 90 degrees, and show the text string that appears within the parentheses.

To use this file yourself, simply replace my name with a single line of text. Be sure to leave the parentheses intact, however; that is how the PostScript interpreter identifies text strings. The bounding box has been made arbitrarily tall so that most names will fit without changing the header. However, in these days of hyphenated names, you may find that the last few letters of your copy get clipped when the file prints. If this happens, you can increase the size of the bounding box.

The four numbers that follow the bounding-box comment determine its size. The first two numbers set the x- and y-coordinates of the lower-left corner of the box, the second set of numbers set the x- and y-coordinates for the upper-right corner of the box. Obviously, the difference between them determines the size of the bounding box. So when the bounding box comment is

```
%%BoundingBox: -10 0 2 500
```

the width will be 12 points (more than sufficient for the 5-point type we are setting) and the height will be 500 points—good enough for most names.

Changing the last value from 500 to 600 or more should solve any problems. Once the file is saved to disk, you can pull it up in *PageMaker* and use it just like any other .EPS file.

If you have been following the logic of this little .EPS file closely, you'll have noticed that numbers and text strings always precede the commands. That's because PostScript uses postfix notation (often called *Reverse Polish Notation*), in which the data is always listed first, followed by the operators that will act upon that data. Thus, the `moveto` operator is preceded by the appropriate x- and y-coordinates.

Postfix notation is necessary because of the way PostScript stacks all operations in memory. For example, if you were to issue an `add` command, PostScript would pop the two topmost numbers off the stack, perform the calculation, and then push the result back onto the stack for further manipulation. Without the correct number of

elements in the stack, all you'll get at print-out time is an error message.

The best-behavior rule applies not only to the structure of an .EPS document, but to its operators as well. Drawing operators are considered well-behaved; an `erasepage` command is not. Since Encapsulated PostScript images are designed to be transported between applications, it would be foolish to allow the use of operators that could destroy data embedded within another PostScript program. A dangerous operator such as `initgraphics`, which reinitializes the graphics environment, could wipe out not only the EPS image, but the entire page of a *PageMaker* document on which it appears.

In addition to standard and .EPS files, there is a third PostScript format: *Adobe Illustrator* files. PC users are growing increasingly familiar with the .AI extension and with the benefits provided by what is often referred to as *editable EPS*. *Illustrator* files take the good behavior rules to the *nth* degree. Indeed, this format is so restricted that all of the operators can be defined in the prologue.

For example *Adobe Illustrator 1.1*—the most often used format for compatibility's sake—has such a limited set of operators that it uses four connected arcs to describe a circle, rather than having a separate circle operator.

Since the information is so easy to parse, many graphics applications have taken to translating PostScript operators into their own native format. In effect, such applications are implementing partial PostScript interpreters. Once the PostScript file is translated, the image can be edited.

Regardless of which format you work with, .PS, .EPS, and .AI files are all true PostScript programs, so they can be sent to a PostScript device for interpretation. In fact, with just a little tweaking, you can even use the DOS COPY command to proof .EPS files directly from your hard disk to a PostScript printer.

PROOFING .EPS FILES FROM DOS

If all you need is a quick printout of an .EPS file, there's absolutely no need to load up *PageMaker*, create a new document, import the file, and then print out to your PostScript device. The modified .EPS file shown in Figure 2b can be printed directly from DOS.

The easy part is adding the `showpage` command to the very end of the file. Without this, the interpreter will create the image in memory, but will never apply toner to the page. Normally, .EPS files rely upon the importing application to issue the `showpage` command. Don't worry about the extra carriage returns (blank lines):

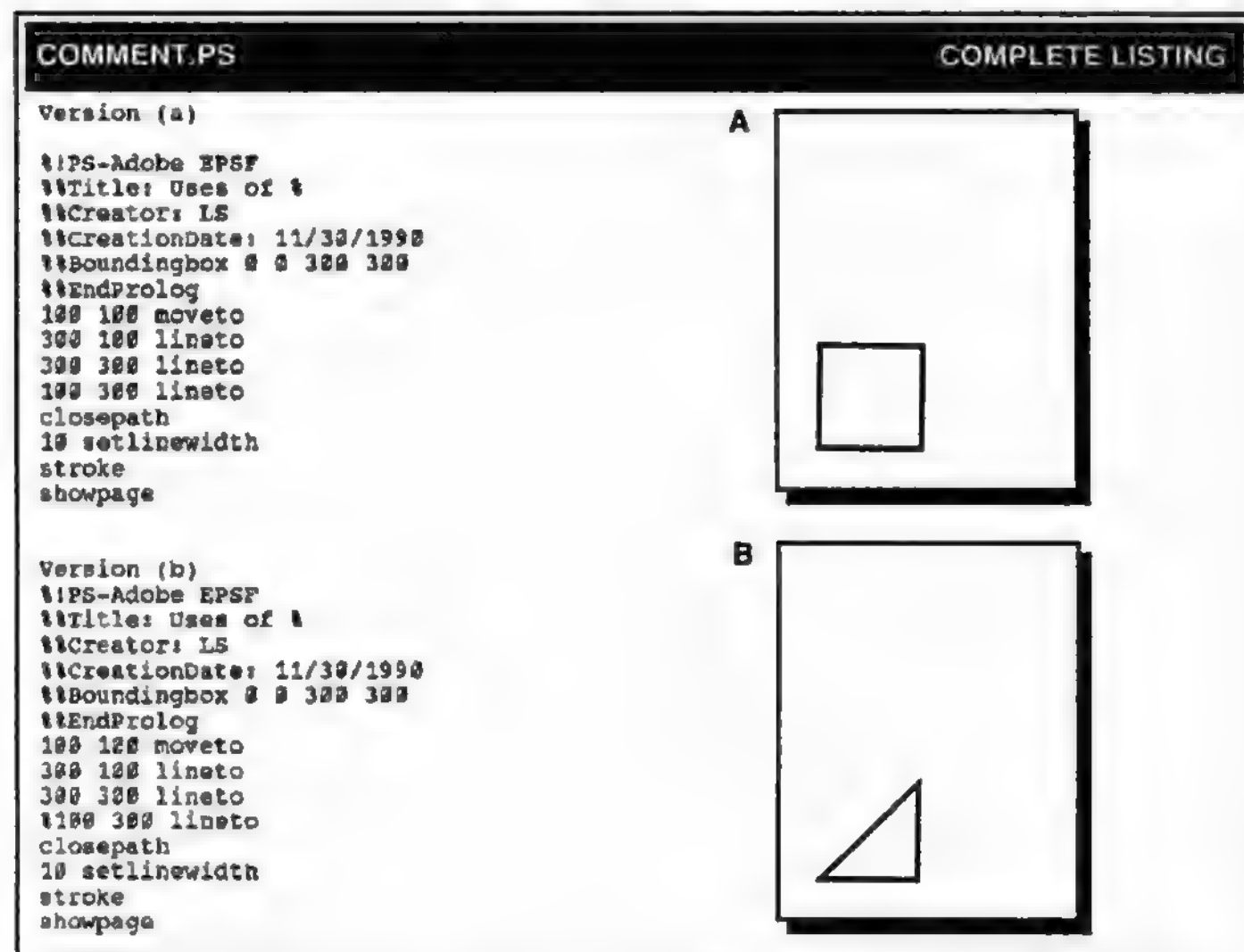


Figure 3: By commenting out the `100 300 lineto` command with a %, PostScript will turn the square created by version (a) into a triangle (version b). (The output shown in this figure has been reduced for reasons of space.)

Now, buy a computer or pick up a part and just say "Charge it!"



Northgate's Big 'N' Card frees up your other credit cards!

Greater purchasing power! Northgate's Big 'N' credit card gives you the purchasing power you need to put Northgate's industry-leading technology to work for you.

Greater convenience! When you carry the Big 'N' card, you have the convenience of purchasing a system, upgrades or peripherals right at your fingertips. And you don't need to worry about tying up your credit line on your other cards.

Instant credit! If you're a credit qualified customer, we can usually set up your account the same day you call. Simply give us a ring and answer a few brief questions. Your Big 'N' representatives will call you back — fast — with the amount of credit available to you.

Then, call toll-free one of our systems consultants to select the Northgate configuration that perfectly matches your needs.

Northgate leases systems, too! If you need multiple systems for business applications, you owe it to your business to consider leasing from Northgate. We offer flexible terms up to five years.

CALL TOLL-FREE
800-828-6125

CONTINENTAL U.S. ONLY

Hours: Monday-Friday 7 am-8 pm CST



"Smart Tools For Business"

7075 Flying Cloud Drive
Eden Prairie, MN 55344

Notice to the hearing impaired: Northgate has TDD capability: Dial 800-535-0602.

Lab Notes

PostScript will continue to interpret a file as long as there is a stream of information coming down the pike. I leave the carriage returns in to segregate the temporary operators I've inserted for printing—it makes it easier to delete them after I've proofed the file.

At this point, you've told PostScript to print the image. The only problem is that you haven't told PostScript *where* to print the image.

Remember the bounding box information is only a comment in the header. And as a comment, only importing applications (such as *PageMaker*) can use this information, not a PostScript interpreter. These applications use the coordinates in the bounding box to size the .EPS file when it imports it. But since you are printing it directly from DOS, you must tell the interpreter the positioning information that the target application would normally supply. And you'll have to insert this before you can actually send this file to a printer.

At the moment, the only positioning instruction is a 0 0 *move to* command. This will print the photo credit at the extreme lower-left corner of an 8.5- by 11-inch page. PostScript assumes an *x*- and *y*-coordinate system that covers the entire page. The grid is set up in points (points and picas are the measurements commonly used in commercial design and printing environments). Given a standard letter-size sheet of paper, with coordinates starting at the lower-left corner (0,0), the furthest point (the upper-right corner) is designated at 612 (for the *x*-coordinate), and 792 (for the *y*-coordinate). If you do some quick math, you'll see that there are 72 points per inch.

One special consideration applies to those of you working with PostScript-enhanced LaserJets. PostScript will let you position an image anywhere on its grid: there are margins built into the hardware. The 0,0 coordinates listed in the .EPS file of Figure 2a can thus be imaged by PostScript, but those coordinates fall within nonprinting border of the HP laser engine. If you position your image at 0,0—there won't be an interpreter error, but the engine won't be able to print at least some portion of the file.

Just to be safe, then, I've built a temporary *x,y* location into Figure 2b. This location also provides a good example of pro-

logue definitions in action. The line

```
/inch {72 mul} def
```

in the prologue means that all subsequent move commands using the word *inch* will be multiplied by 72 points. The line

```
1 inch 1 inch translate
```

in the script portion "translates" to a point 1 inch from both the left and bottom edges of the paper into my new point of origin for the credit line. (You might find it helpful to distinguish, as I have done, between the

**PostScript still has the
decided edge in
typeface manipulation.
It can rotate, pattern fill,
perform vector
clipping, and distort
letterforms while still
in text mode.**

original Encapsulated PostScript file of Figure 2a and the modified, printable version of Figure 2b, by saving the latter with a .PS rather than the original .EPS extension.) Everything is now in place to print this file directly from the DOS prompt by issuing the command

```
copy credit.ps lpt2:
```

The basic skills you've just learned can be valuable in troubleshooting some of the more common problems with .EPS files. If a faulty driver were to write out a too small bounding box, it is a simple matter to fix. Just print the .EPS file out to the printer, using the methods discussed here. Then measure the live area of the picture, convert the dimension information to points, and type in an appropriate bounding box comment.

Another trick you may wish to employ in troubleshooting is to use the percent sign (%) to turn a command into a comment. Remember, PostScript will not attempt to

interpret anything preceded by a percent sign. Temporarily commenting out questionable lines of code has often allowed me to import and print a problem .EPS file. True, this technique works best on small files, and it helps if you can easily identify the potential problem. A *move to* command with only one coordinate position is enough to bomb out the interpreter, for example. But I have actually had .EPS files that printed out perfectly with a few extra percent signs added to the file.

To see the effect of a single line of PostScript code, consider Figures 3a and 3b. In the (a) version of this program, PostScript draws a square. The (b) version comments out the third *lineto* operator but continues with the *closepath* command. PostScript responds by drawing a triangle.

Someone once told me that the EPS format is like a black box—you can't see what's inside. The examples I've presented prove that you can see what is inside the file. However, when something does go wrong, it is often difficult to locate the exact command that's causing the error. The PostScript interpreter doesn't print out partial files, and herein lies the difficulty. If an operator blows up even one line before *showpage*, nothing will print.

For this reason, if you're faced with a recurring need to debug .EPS files, or if you want to pursue PostScript programming seriously, you should consider getting a copy of *EHANDLER.PS* from Adobe Systems. This little utility will print out whatever was in memory before the error occurred—allowing you to more easily locate the offending operator.

TEXT MANIPULATIONS

For most business users, PostScript's most important benefit may be the Adobe Type 1 scalable font technology. Until the introduction of AGFA Compugraphic's Intellifont Scalable Typefaces, Adobe's outline font technology was the *only* way you could resize typefaces on the fly without a loss of quality. However, the introduction of Intellifont typefaces, together with Hewlett-Packard's support for them in PCL 5, have given users a scalable alternative to Adobe Type 1 fonts.

HP is clearly targeting the business-user market with PCL 5 and the Intellifont technology. Indeed, with a range of 0.25 to 999.75 points (in quarter-point increments), eight resident scalable fonts (four weights each of CG Times and CG Univers), and the ability (at long last) to print in either portrait or landscape mode, PCL 5

100%
compatible for
All standard
templates fit!

At Last... A Vintage 101 Keyboard!

Announcing Northgate® OmniKey™/101...
keyboard technology aged to perfection!

\$89⁰⁰
FOB Minneapolis

More than meets the eye! On the surface, *OmniKey/101* NI may look like an exact duplicate of the standard IBM® 101. All the keys are in the same place. But the similarities end there. You get exclusive Northgate features that let you input data faster than you ever dreamed possible.

Faster, more precise typing by design! Your new *OmniKey* features renowned ALPS click/tactile mechanical key switches. These marvelous devices affirm every entry with feedback you can hear and feel.

No more U>S>A>! Imagine the convenience of being able to lock out these < > even when shifted. You'll never type U>S>A for U.S.A. again!

You get 'N' key rollover feature for speed typing accuracy and colon lock feature so you don't need to hit Shift.

Customize the CTRL, CAPS LOCK and ALT key configuration. Retain standard IBM enhanced layout or switch CTRL, CAPS LOCK and ALT keys where they suit your typing preferences.

More great features! We added a rate select feature that lets you change repeat rate from 3 to 120 CPS at the touch of a key. *OmniKey/101* NI has a sturdy metal base and weighs a hefty 5½ lbs so it won't slide around on your desk.

You get unmatched compatibility with IBM®-AT, XT, Tandy, Compaq®, AT&T 6300 and other IBM type systems, lifetime quality double injected keycaps and industry-leading 5-year warranty. We've even included an *OmniKey* dustcover to protect your 101 when you're not using it. FCC Class B certified, too.



Sample It For 60 Days ...
Full Money Back Guarantee

CALL TOLL-FREE TODAY!

800-828-6133

IN U.S.A. AND CANADA

CHARGE IT! We accept your Visa, MasterCard or Discover credit card.

HOURS: MON-FRI. 7 AM-10 PM; SAT. 8 AM-4 PM Central. Call for quantity discounts, dealer and distributor prices. Se habla español por su conveniencia.

Notice to the Hearing Impaired: Northgate has TDD capability: 800-535-0602.



"Smart Tools For Business"™

7075 Flying Cloud Drive, Eden Prairie, MN 55344

©Copyright Northgate Computer Systems, Inc. 1991. All Rights Reserved. Northgate, OmniKey and the Northgate 'N' logo are trademarks of Northgate Computer Systems, Inc. IBM is a registered trademark of International Business Machines Corporation. All other product and brand names are trademarks and registered trademarks of their respective companies. Prices and specifications are subject to change without notice. Northgate reserves the right to substitute components of equal or greater quality and performance. All items subject to availability. We support the ethical use of software. To report software copyright violations, call the Software Publishers Association's Anti-Piracy Hotline at 1-800-368-7088.

Lab Notes

MATRIX1 and MATRIX2.PS

(4) **Matr(x1.P6**

```
%%PS-Adobe EPSF
%%Title: Condensed Matrix
%%Creator: LS
%%CreationDate: 11/30/1998
%%BoundingBox: 0 0 118 72
%%EndProlog
```

```
tCondensed type
@ setgray
/Helvetica-Bold findfont [23.7 @ @ 72 @ @] makefont setfont
100 100 translate
@ @ moveto
(MATRIX) show
showpage
```

(b) Matrix2.PS

```

%%PS-Adobe EPSF
%%Title: Oblique Matrix
%%Creator: LS
%%CreationDate: 11/38/1990
%%BoundingBox: 0 0 298 72
%%EndProlog

```

```
%Reverse Oblique
B setgray
/Helvetica-Bold findfont [64.8 B -45 72 0 0] makefont setfont
138 182 translate
0 0 moveto
(MATRIX) show
showpage
```

MATRIX

MATRIX

Figure 4: The bracketed numbers preceding the `make font` command change the appearance of the font drastically. A detailed explanation of their meaning is given in Figure 5. (The output shown in this figure has been reduced for reasons of space.)

may provide all the font technology that office users need. And since many of the remaining restrictions—if you can call them that—are imposed by the printing engine, there is great potential for Intellifont Scalable Typefaces to migrate to higher-resolution devices.

At the moment, however, PostScript still offers advantages for the professional designer and the truly finicky desktop publisher. Compare the eight resident fonts of the HP LaserJet III with the 13 or 35 resident typefaces in a PostScript printer. With over 6,000 designs from Adobe and major type vendors like Monotype, there are simply more Type 1 fonts available. Because PostScript formats are independent of the hardware, Type 1 fonts are guaranteed to be stored in identical form on desktop laser printers and on Varityper, Linotronic, and even AGFA Compugraphic high-resolution typesetters. This ensures that the proof you get is an accurate preview of the final typeset output.

When it comes to manipulating typefaces PostScript still has a decided edge over PCL 5. Though the Hewlett-Packard PDL can create many special effects with letterforms, it can only do so *after* it has converted the text to a graphical vector

outline. By contrast, PostScript can rotate, pattern fill, perform vector clipping, and distort letterforms while still in text mode.

The two small PostScript files shown in Figure 4 illustrate how a single PostScript operator, `makefont`, can be used to manipulate and distort a six-value font matrix. The numerical values that appear in brackets control the general appearance of a Type 1 font and are diagrammed in Figure 5. Specifically, the first number scales the

width of the letterform. The second number changes the sine value. The third number is the negative sine value and can create oblique transformations such as italics. The fourth number scales the height of the letter. The fifth number affects horizontal positioning and moves the text along the x-axis. The sixth number affects vertical positioning and moves the text along the y-axis.

Merely by changing one value in the matrix, you can dramatically alter the appearance of the typeface. In the first instance, I've created a condensed typeface by entering a width value one-third of the height value. In the second version I've created a reverse oblique effect by using a negative value for the negative sine (a positive value would have resulted in a standard italic face).

Just for a moment, consider how easy it is for you to understand these two small programs. PostScript designates fonts by name and the `findfont` operator. Thus, if you need to change the typeface at print-out time and you just don't have time to re-compose a long PostScript document, you can make the necessary changes with nothing more than your word processor. Changing the font used in these PostScript files is as simple as replacing the word Helvetica-Bold with Times-Roman.

Although this brief look at PostScript has explored neither the depth nor the elegance of the language, it has given you a feel for the language and a number of basic troubleshooting skills. If you are intrigued by what you've seen here, you can get further information in *PostScript Language Tutorial and Cookbook* and *PostScript Language Reference*, both written by Adobe Systems and published by Addi-



HOW POSTSCRIPT SHAPES FONTS

$$\begin{bmatrix} 23.700 & 72.00 \\ 64.80 & -45 & 72.00 \end{bmatrix}$$

Scales the width of the letterform

Changes the sine value

The negative sine value, which can — create oblique transformations, such as italics

Scales the height of the letter

Affects horizontal positioning and moves the text along the x axis

Affects vertical positioning and moves the text along the y axis

Figure 5: By simply changing the bracketed numbers in a single command, PostScript turns out two very different typefaces from the same font.

Only Northgate® has the "Guts" to make better keyboards.



It companies treat keyboards as an afterthought. Not if you've spent countless hundreds of thousands of dollars and time to make using them enjoyable.

Users explored optional 17 F-key ergonomics and checked never out < > U.S.A.

John War-minal work research Cen-telopment of face of PC-design. If the edictable, it is basic introduc-tion ge description u get the most and future capa-

computing editor of PC

APRIL 30, 1991



OmniKey/102 with F-keys on left

Just **\$89⁰⁰** PCB Minneapolis



OmniKey/ULTRA with F-keys on top and left

Only **\$129⁰⁰** PCB Minneapolis

interchangeable CTRL, ALT and CAPS LOCK on left, CTRL and ALT on right. Plus, you can swap the Backslash and Asterisk keys.

Our efforts have been well received. Northgate OmniKey keyboards are clearly the choice of experts and users alike. A PC Magazine Editor's Choice, two Computer Shopper Best Buy Awards and PC Computing's Most Valuable Product awards are proof.

60-day no-risk trial! Use OmniKey/102 or OmniKey/ULTRA for 60 days. If you're not 100% satisfied, we'll buy it back! Keep it and it's protected by a full 5-year parts and labor warranty.

You just can't lose ... order now! Call for quantity discounts, dealer and distributor pricing.

CALL TOLL FREE **800-828-6133** IN U.S.A. AND CANADA

Notice to the Hearing Impaired: Northgate has TDD capability: 800-535-0602.

NORTHGATE COMPUTER SYSTEMS, INC.
"Smart Tools For Business"™
7075 Flying Cloud Drive, Eden Prairie, MN 55344

OmniKey and the Northgate "N" logo are trademarks of Northgate Computer Systems, Inc. IBM is a registered trademark of International Business Machines, Inc. All other product names. Prices and specifications are subject to change without notice. Northgate reserves the right to substitute components of equal or greater quality and performance. All items in violation, call the Software Publishers Association's Anti-Piracy Hotline at 1-800-388-PIRS.



Your Passport To Translation.

Translating text is fast and easy with the Language Assistant Series: Spanish Assistant, French Assistant, German Assistant and Italian Assistant.

The Language Assistants translate simple English documents by analyzing individual sentences. They translate words, search for phrases, conjugate verbs, provide gender and number agreement, and work with word order.

The Language Assistants also include on-line bilingual dictionaries, grammar help topics, and a verb conjugator.

CIRCLE 511 ON READER SERVICE CARD

A Great Deal In Any Language!

- ▶ Helps you translate and write while improving your foreign language skills
- ▶ Pop up help with powerful reference tools
- ▶ Easily add foreign and accented characters
- ▶ Includes integrated ASCII text editor

Only \$79.95—Order Now!

Give your PC bilingual power with Spanish Assistant, French Assistant, German Assistant or Italian Assistant. Order your copy today! 30-day money-back guarantee.

**See Your Software Dealer
Or Call (800) 366-4170.**



MICROTAC SOFTWARE

4655 Cass St., Suite 214, San Diego, CA 92109
Phone: (619) 272-5700 • Fax: (619) 272-9734

Lab Notes

son-Wesley Publishing Co. (New York, 1985). In addition, *Graphic Design with PostScript*, by Gerard Kunkel (Scott, Foresman and Company, Glenview, Illinois, 1990) will guide you from the most elementary concepts through sophisticated programs.

Of course, PCL 5 and the AGFA Compugraphic Intellifont technology will continue to improve. Moreover, Microsoft has announced—but still not yet released—TrueImage and TrueType, which also promise to deliver much of the functionality of PostScript (including Display PostScript) as part of the Windows and Presentation Manager environments. How all of this fits together with PostScript Level 2 and the Adobe Type Manager (which brings Display PostScript technol-

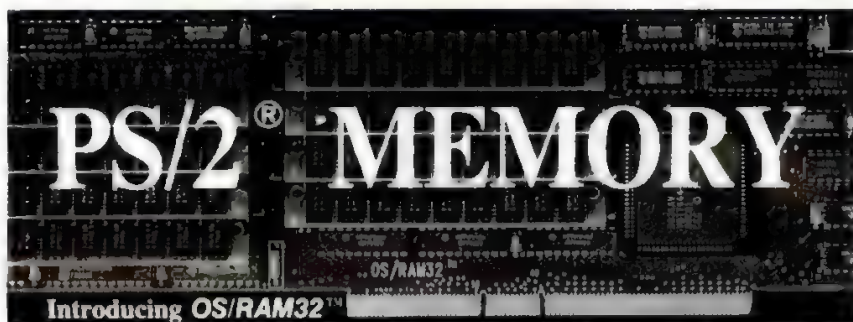
**PostScript has clearly
changed the face of
PC-based electronic
publishing design.**

ogy to the Windows 3.0 environment (though only for text) remains to be seen.

From a user's perspective, however, it is reassuring to see that the two current major players are seeking peaceful coexistence. Hewlett-Packard is now an official Adobe PostScript Cartridge Partner. The LaserJet III (\$695). And Adobe has introduced a \$495 PostScript Cartridge for the LaserJet Series II.

PostScript's history is clearly a success story. Xerox's Gary Starkweather, John Warnock and Charles Geschke's success at Xerox PARC (Palo Alto Research Center) and the subsequent development of PostScript have changed the face of PC-based electronic publishing. The future of PostScript is undoubtedly exciting. And this new paradigm of publishing in multiple languages should help you move from PostScript's current limitations.

Luisa Simone is a contributor to *PC Magazine*.



- ✓ 8 Mbytes of fast 32 bit memory.
- ✓ Works in all Micro Channel™ computers.
- ✓ Fast LIM 4.0 driver included.
- ✓ Provides extended and expanded memory.
- ✓ Easy switchless installation.
- ✓ Automatic configuration for DOS, OS/2 or UNIX.
- ✓ Risk free guarantee. Two year warranty.
- ✓ Accepted under IBM service contracts.
- ✓ From \$299 to \$998 with 8 Megabytes.
- ✓ "Best price performance", says PC Week.

Call today 617-273-1818 or 1-800-234-4CEC



Capital Equipment Corp.
Burlington, MA. 01803

PS/2 and Micro Channel are trademarks of IBM

CIRCLE 126 ON READER SERVICE CARD

by
Michael Holmes
and Bob Flanders

Utilities

Do you have to type a 50-character path-name to get to the directory you want? Would you like to be able to locate and directly switch to a directory that contains a specific file? Do you wish you could change directories without having to enter all of a long directory name? Take heart: CDX (Change Directory, Extended) will take care of all this.

CDX lets you jump to other directories—even directories on other disks—without specifying the names of all the intervening subdirectories. Indeed, you won't even have to spell out the complete name of any directory. Additionally, CDX will locate any file and change to the directory that contains it.

CDX can do this because it scans the entire directory structure—optionally, of several or all drives, including floppies—for the file(s) or directory(s) you specify. Since more than one directory match may be found, as each qualifying directory is encountered it is displayed on the command line with a question mark (?) appended. While you're deciding whether or not to accept the directory displayed, CDX continues its search. This way, if you type N, CDX is likely to have already found the next qualifying directory and to be ready to display it. This process will continue until no more qualifying directories are located, or until you hit Y. Then CDX will place you in that directory.

You can download a copy of the executable CDX.COM file from PC MagNet, as explained on the PC MagNet News page following this article. As an alternative, you can download CDX.BAS; running this file in BASIC will create CDX.COM on your disk. You can also download the CDX.C source code and compile it yourself with Microsoft C 6.0, following the instructions given in the "Compiling CDX.C" sidebar. If you don't have a modem, we can fax or mail you the source code listings. Simply send a postcard with your name, address, and fax number (if applicable) to Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016; Attention: Katherine West.

Finding and Changing To the Directory You Want, with CDX.COM

■ Large disks and multilevel directories can make locating files and their subdirectories a nightmare, unless you have this handy utility.

USING CDX

The full command syntax for CDX is

```
CDX [/B] [/+] [/F filename]
[d:]p1 p2 ...pn
```

Entering just CDX presents a help screen that briefly explains the syntax. The /B switch tells CDX to change to the first qualifying directory without prompting you for possible alternatives. The /+ switch is used to include A and B floppy disks (they are excluded by default) among the drives to be checked. Floppies can also be included by being specifically named in the *d:* specification, as explained below. The /F switch tells CDX to qualify only directories that contain a file that matches the *filename* you supplied. The filename, which may contain the DOS ? or * wildcard characters, must be separated from the /F switch by one or more spaces.

The specification options that tell CDX which drives to search and which directories to find, follow the slash (/) parameters on the command line. However, you can enter the switches in any order. The *d* variable, followed by a colon (:), is used to list one or more specific drives to be searched in the order named; for example, CDE:. If

no drive specification is provided, only the current drive is checked. If preceded by a minus sign (-), *d:* excludes the listed drive(s). Thus, a drive specification of -CH: will exclude these two hard disk drives (as well as the floppies, unless the /+ switch was included on the command line), but will include all others. The drive specification *: includes all drives except the floppy disks, which again can be included with the /+ switch or by being individually named in the *d:* drive series, as in CDEAB:.

The *p1* variable immediately following the drive-specification colon names the first directory to be found or searched. If the backslash character is included as part of *p1*, the search of the drive(s) will commence with the root directory; otherwise, it begins with whatever directory is current on the drive(s). The backslash is also used when you wish to change specifically to the root directory of another drive. To do this, you simply enter one drive letter and colon followed by a backslash; for example, CDXE:\.

When CDX is used with the /F switch to find and change to any directory that contains a specified filename, then the DOS * wildcard character can be entered as the *p1* parameter. (Alternatively, in such a case *p1* may be omitted altogether.) As will be explained and illustrated below, to shorten the search process you can provide CDX with the names of one or more directories to search, each separated by a single space.

Entering CDX. with no other parameters simply displays the already current directory. Entering CDX .. changes to the

COMPILING CDX.C

by Bob Flanders

As published, CDX is implemented in the TINY model of Microsoft C 6.0. Although there is no specific code that requires this model, CDX is thus able to take advantage of several features (an integer and a pointer are both 16 bits, for example) that are common to both TINY and SMALL models. The choice of this model also made it possible to keep the executable size down to approximately 6.8K.

You should use the command that's listed below in order to compile the program with C 6.0:

```
cl -AT -Gs -Os cdx.c /link /NOE
```

The -AT switch tells the compiler to use the TINY model of the compiler. This causes the executable to be pro-

duced as a .COM file.

The -Gs switch tells the compiler to turn off stack checking. This switch can be removed when you are changing and testing the code.

The -Os switch causes the compiler to optimize for space. Since CDX is mainly an I/O-bound program (searching the directories), a little inefficiency can be tolerated in some of the control structures.

Finally, the /NOE switch tells the linker to use the _nullcheck and _setenvp functions defined in the source code. These are included to disable the checking for null pointers and processing of the DOS environment.

CDX also uses the _fastcall convention. By placing operands in registers instead of on the stack it reduces the amount of code generated. ■

parent directory, and CDX \ changes you to the current drive's root directory. If you enter CDX with no parameters, you'll get the help screen.

COMMAND EXAMPLES

A few examples may help clarify the basic CDX syntax. The command

```
CDX *123
```

will search all but the floppy drives for a \123 directory and will change to it if you hit Y in response to the ? prompt. Take note of the fact that the disk search will continue while you decide whether to enter Y or N. That's so that less time will be lost if you decide that you want the E:\123 directory, not the C:\123 directory that was found first. Note that any directory that begins with the characters 123 will be found (for example, \123GO).

Similarly, assuming that F: is the last hard disk in your system, the command

```
CDX /+ -EF:123
```

will search drives C:, D:, A:, and B: for a \123 directory, again prompting you at the first \123 directory found. This command is thus equivalent to

```
CDX CDAB:123
```

If you have no \123 directory, or if it is located on E: or F:, CDX returns you to your current directory and provides the error message "Requested path not found."

The command

```
CDX /B /F *.LTR D:*
```

changes you automatically to the first directory located on drive D: that contains a .LTR file. If you've just consolidated all your correspondence (.LTR) files into a single \LETTERS directory on drive D:, you can check to see whether you've overlooked any on other drives. If you've got them all moved, the command

```
CDX /F *.LTR -D:*
```

should return the message "Requested path not found." Note that in the last two examples, the wildcard asterisk after the drive specification colon may be omitted.

None of the examples presented thus far have made use of CDX's ability to recognize partial directory names. This feature is best illustrated in Figure 1, which will be used for all subsequent examples. Figure 1 assumes that your system has two

disk volumes, C: and D:. Drive C: is used for your payroll, DOS, invoices, and accounts payable. Drive D: contains OLDPR, which holds payroll information more than three years old and whose 1986 subdirectory contains a backup of data entered before a midyear conversion from another payroll system. Drive D: also has a subdirectory for invoices.

If you're on drive C: and you want to get to its DEC90 invoices directory, the normal DOS command would be

```
CD \INVOICES\DEC90
```

Using CDX you *could* get there by entering two values for *p* (you need not specify a drive, since C: is already your current drive), thus:

```
CDX INVOICES DEC90
```

CDX would then supply the prompt

```
C:\INVOICES\DEC90 ?
```

and you would hit Y to make the change.

Obviously, in such a case CDX would provide no keystroke saving over using the regular DOS procedure. But CDX lets you enter the alternative command

```
CDX /B DE
```

in response to which it searches the C: drive looking for a directory that begins with the characters DE. Because the only directory on the C: drive that begins with DE is \INVOICES\DEC90, it will be selected. And because you specified /B, CDX will automatically change to it.

Again, where are your September 1990 invoices? By using the drive list operand *d:*, you can run through both drives and find their subdirectory thus:

```
CDX CD:IN SEP90
```

Indeed, if you know (and remember) that only one subdirectory is named SEP90, you could simply enter

```
CDX CD:SEP90
```

Expanding on the example in Figure 1, assume you are now connected to a local area network that adds three more drive letters to your system. You could search every drive (including the network drives) for the INVOICES\MAY90\BACKUP directory with the command

You'll Like What's Inside the CompuAdd 333T. *PC Magazine* Did!

- *PC Magazine* Editor's Choice (December 25, 1990)
- Finalist, *PC Magazine* Award for Technical Excellence, 1990
- CompuAdd's award-winning customer service



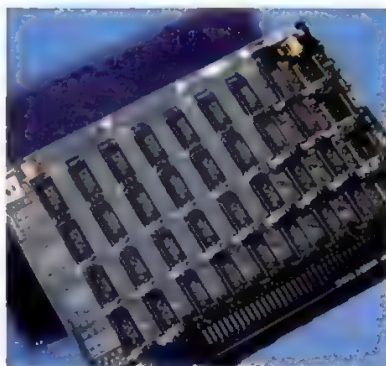
CompuAdd's Hot Slots Boost 333T Performance



Look inside the CompuAdd 333T. You'll see what prompted *PC Magazine* to call it "a speed demon" and "a power user's dream machine" in its review of 45 leading 33MHz 386 computers.

You'll see CompuAdd-exclusive "hot slots," two 16-bit expansion slots designed to maximize performance of the CompuAdd HardCache/ESDI controller card and the CompuAdd Hi-Rez VGA card. Each slot still works perfectly with a standard 16-bit expansion card, should you choose that option. And you'll see a motherboard designed by CompuAdd to take maximum advantage of the optional, ultra fast SRAM board.

Now, run the 333T. You'll see the speed that makes it the *fastest 33MHz 386* computer you can buy — as measured by top scores on *seven of nine* PC Labs benchmarks, including the 386 Instruction Mix Text. In its review, *PC Magazine* said the CompuAdd 333T "scored the best time in the group, or close to it, on every test we put it through, boasting the best overall performance in the field."



The CompuAdd 333T is the right choice when you need full-scale multitasking capabilities in either a reliable network file server or a powerful standalone workstation.

Compare the 333T. You'll see why *PC Magazine* praised its "top-notch expandability" and its "quality construction throughout," and why *PC Magazine* concluded that the 333T was the "best value in an intelligently designed PC."

You'll see that in value and performance, the competition can't touch the

CompuAdd 333T. With the CompuAdd 333T at the heart of your network, you'll have the power, speed and expandability you need. Speed to keep your work flowing. Power to run today's — and tomorrow's — 32-bit software. Expandability to grow with your business. And the CompuAdd commitment to quality and service.

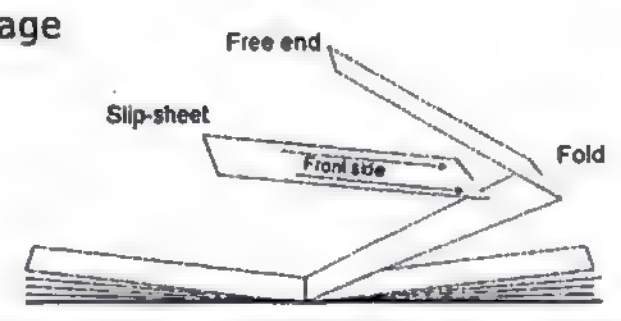
Call today for a CompuAdd value on the computer *PC Magazine* says "will be hard to beat at any reasonable price."

CompuAdd®

Customer driven, by design.
12303 Technology, Austin, Texas 78727

© CompuAdd Corporation, 1991. We accept MasterCard, VISA, Discover, money orders, certified checks and personal checks (please allow ten days for processing). CDOs (\$50 minimum order), company and institutional purchase orders (minimum initial purchase \$500, thereafter \$50), and wire transfers. Please add 2% to all purchases for shipping and handling (minimum \$3, shipping outside the continental United States will increase cost). Add 8% for shipping and handling to APO/FPO addresses (minimum \$10). Please add appropriate local sales tax. Thirty-day money-back guarantee does not include return freight or shipping and handling. Opened software, videotapes, other consumables and shipping costs are nonrefundable. All return items must be accompanied by a return merchandise authorization (RMA) number. Prices and product descriptions are subject to change without notice. CompuAdd is not liable for damage due to omissions or typographical errors. Call 800-444-1672 for a copy of CompuAdd's complete warranty.

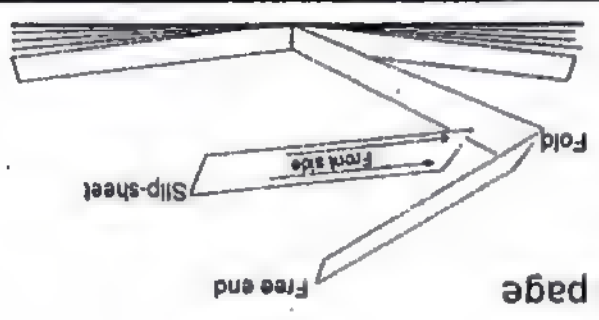
1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet

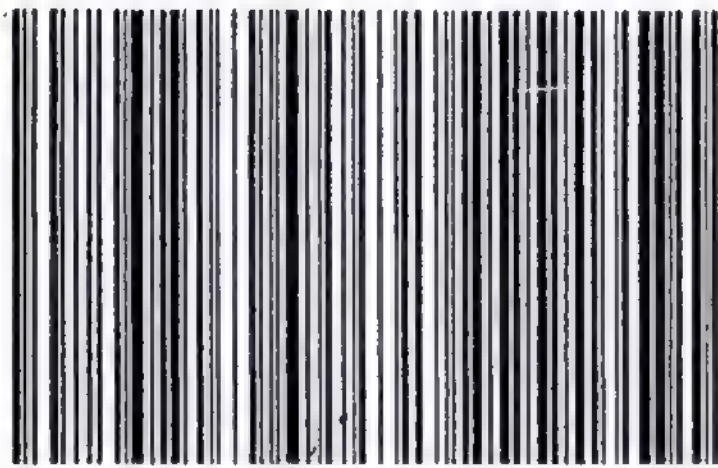


1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-0018

Back

1. Follow instructions on the other side

COMPUADD 333T: BES

Look Inside the "Power User's Dream Machine"

PC Magazine, December 25, 1990

\$2775



Five half-height internal drive bays.

Parallel port and two serial ports built in to system board.

CompuAdd's exclusive "hot slot" designed for maximum performance with the CompuAdd HardCache ESD controller.

CompuAdd's exclusive "hot slot" designed for maximum performance with the CompuAdd HardCache ESD controller.

Full-size 3.5-inch floppy diskette drive (FDD) optional.

CompuAdd

Intel™ 33MHz 386 microprocessor, Phoenix BIOS, 64KB cache, math coprocessor socket (supports Intel 80387 or Weitek 3167).

Four half-height front access drive bays.

Motherboard designed by CompuAdd engineers to stretch the 386 performance envelope with the optional high-speed SRAM card.

Room for up to 16MB SRAM or memory.

Full CompuAdd Windows 3.11, CompuAdd MS-DOS 4.01 and FREE Microsoft Working Models preloaded on hard drive models.



CompuAdd 333T: Best Overall Performance



CompuAdd 333T

The 333T is a proven winner, picked as Editors' Choice in *PC Magazine*, December 25, 1990! And picked as a finalist for *PC Magazine's* 1990 PC Technical Excellence award! It's the *fastest 33MHz 386 system you can buy* — as determined by top scores on seven of nine PC Labs benchmarks. In selecting the 333T as Editors' Choice, the editors credited the CompuAdd 333T with "the best overall performance in the field."

CompuAdd 333 Full Profile

The CompuAdd 333 Full Profile desktop system has the exact same performance as the 333T. Only the case is slimmed down. The Full Profile model sports three half-height front access and two half-height internal 5.25" drive bays, six 16-bit and one 8-bit expansion slots. So you have plenty of room to add extra drives and option cards.



Whether you use it as a network server or as a powerful standalone workstation for CAD/CAM, database management, spreadsheet applications or desktop publishing, the CompuAdd 333T or 333 gives you the fastest 32-bit computing power you can get in a 33MHz 386 system!

CompuAdd Value

CompuAdd built its reputation on giving you high performance computers at unbeatable values! Don't

just take our word for it. An independent vendor-neutral survey of PC users asked people how satisfied they are with their PC purchases. *CompuAdd received the best endorsement any manufacturer could ask for* — CompuAdd ranked #1 for Value/Price, Quality, Commitment to the Customer and Overall Satisfaction!

The researchers did not use vendor-supplied customer lists. The independent, statistically valid survey ranked 25 leading PC manufacturers, including IBM, Compaq, Apple and Hewlett-Packard.

Call today for more details on CompuAdd's award-winning products and service!



CompuAdd 333T and 333FP Features

- 80386 microprocessor running at 33MHz
- 4MB DRAM expandable to 16MB
- 0 wait-state cache memory
- High-speed cache memory controller with 64KB SRAM cache
- 5.25" 1.2MB or 3.5" 1.44MB diskette drive
- Dual diskette controller
- Six 16-bit and one 8-bit expansion slots
- Four half-height front access and five half-height internal 5.25" drive bays (Full Profile has three half-height front access and two half-height internal 5.25" drive bays)
- One built-in parallel and two serial ports
- 80387 or Weitek 3167 math coprocessor socket
- **FREE** CompuAdd serial mouse \$24.95 value
- **FREE** CompuAdd Windows 3.0 \$149 value
- **FREE** Microsoft Working Models
- **FREE** CompuAdd MS-DOS 4.01 \$89 value

CompuAdd 333T base system

\$2775 - 66656

CompuAdd 333 Full Profile base system \$2595 - 66665

Enhanced 333 systems upgrade base system features with: 150MB ESDI drive, CompuAdd HardCache/ESDI controller with 1MB RAM, 1024 x 768 color monitor, CompuAdd Hi-Rez VGA card with 512KB RAM and 640KB SRAM card.

CompuAdd Enhanced 333 Full Profile \$5395 - 66669

CompuAdd Enhanced 333T \$5575 - 66660

333 Monitor and Hard Drive Options

	MGA	CVGA
333T 80MB	66658 - \$3575	66659 - \$4055
333T 200MB	66661 - \$3975	66662 - \$4455
333 80MB	66667 - \$3395	66668 - \$3875
333 200MB	66670 - \$3795	66671 - \$4275

CompuAdd®

Customer driven, by design.™

Call 800-456-3660 Key Code 815

Hours: Monday - Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
12303 Technology, Austin, Texas 78727

Utilities

CDX *.INVOICES MAY90 BACKUP

HOW CDX SEARCHES

When you execute CDX from a subdirectory, the first place it searches is in the current directory. If it is unable to find the requested directory there, it goes "down" through the subdirectory structure. If it is still unable to find what you have asked for, it starts moving *up* and searching, until it finally searches the root directory.

Thus, if you're in C:\ACCTPAYB and you enter

CDX 1989

you'll first be prompted with

C:\ACCTPAYB\1989

If you enter N at the prompt, the search will go back up the tree and you'll be prompted again with

C:\PAYROLL\1989

Again, assuming you're in C:\ACCTPAYB, if you want to get to \JAN91,

there's no point in searching your current path at all. In such a case, it will save time simply to enter

CDX \JAN91

so that the initial backslash will start the search right from the root directory.

If you enter the command

CDX /B *.INV

from a drive that does not have a directory that starts with INV, you will end up in the C:\INVOICES directory. That's because drives are searched starting with the current drive, then C: to Z:, and then A: and B: (if requested). On the other hand, if you enter

CDX D:\INV

you'll end up in the D:\INVOICES directory regardless of the drive from which you start, for the order of the drive search you specified overrides the default order.

Since CDX will accept even a single letter as a directory name, it's easy to get carried away and over-truncate the search specification. If you wanted to go to the \INVOICES\AUG90\BACKUP directory and issue the command

CDX /B D:\B

you would go directly (because of the /B command parameter) to the \OLDPR\1986\BACKUP directory instead. You'd be fully safe using

CDX /B D:\INV AUG BAC

to get you to the desired directory, but a more efficient way would be to use the command

CDX /B D:\I B

This tells CDX to search the D: drive for a directory starting with I and then look for a directory below that starting with B. It doesn't matter that B isn't directly below I, only that it is *somewhere* below I.

To generalize, then, you can use whole or partial paths with CDX. If you wanted to go to D:\OLDPR\1986\BACKUP, you could get there by entering *any* of the following commands:

CDX /B D:\OLDPR\1986\BACKUP

CDX /B D:\OLDPR\1 BACKUP

CDX /B D:\OLDPR 1 BACKUP

CDX /B D:\O 1986\B

CDX /B D:\O B

When using the /F switch to look for specific files, however, you must use either the full filename or the DOS wildcards. Thus, if you want to search all directories on the C: drive for the file STATUS.DAT, you would enter

CDX /F STATUS.DAT C:

CDX would then prompt you with each directory containing a file named STATUS.DAT. Since wildcards are acceptable, to find those directories on drive C: that contain files with the extension .DBF, you would enter

CDX /F *.DBF C:

Each directory with a qualifying file would then be prompted.

The following rules summarize the CDX search algorithm:

- First, check the current directory of the drive being searched, then all directories below it, unless the first operand's directory specification begins with a backslash. In that case, search from the root of each drive.
- If not found there, move up one directory

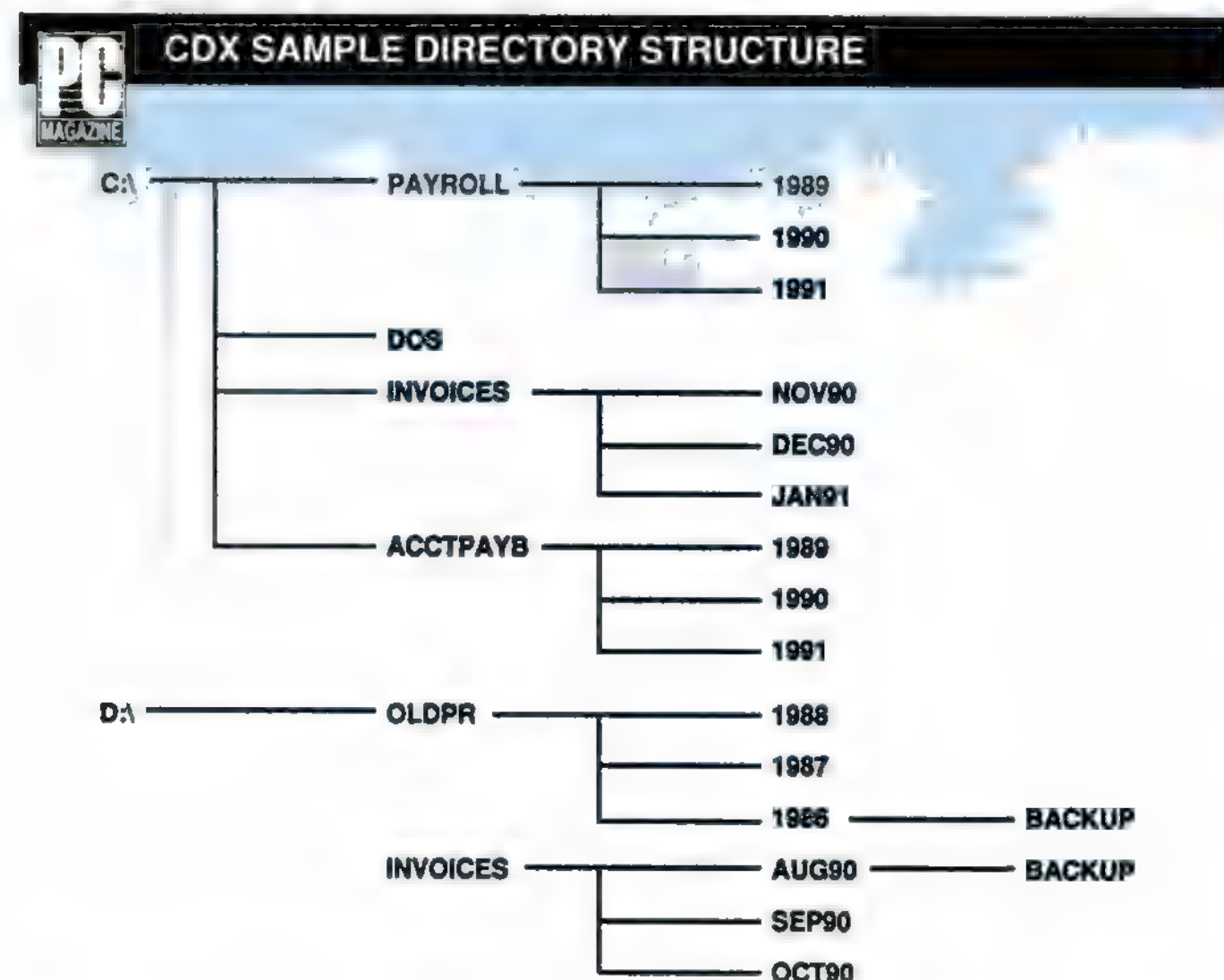


Figure 1: This directory structure is presupposed by the explanation of CDX operations provided in the article text.

Everything your lap desires.

And everything your desk desires, too.

Is it really possible to have all your needs met by just one laptop?

Good question.

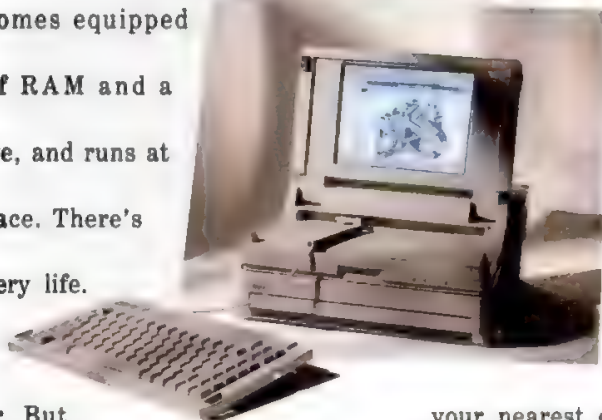
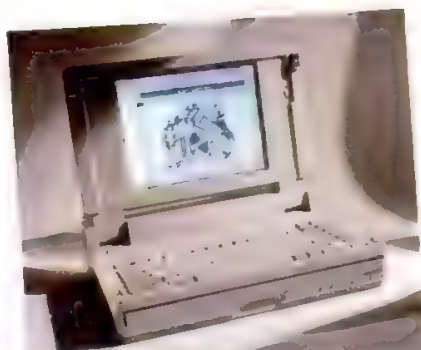
For which we at NEC have a great answer.

The ProSpeed™ SX/20.

A small, lightweight 386SX laptop that utilizes a unique modular design to meet all your computing needs. Whether you desire a high performance portable or a fully configured desktop system.

Technically speaking, the ProSpeed SX/20 comes equipped with up to 5MB of RAM and a 40MB hard disk drive, and runs at a blinding 20MHz pace. There's also 8 hours of battery life.

Now all this looks good on paper. But



how does it look on a computer?

Well, thanks to a CRT quality LCD screen with VGA resolution, the answer is crisp and clear.

Which, of course, brings us to the sensitive topics of expandability and connectivity.

In other words, all that you gain in a desktop but usually lose in a laptop.

The exception, of course, being the ProSpeed SX/20.

Its unique Docking Station™ allows you to easily make the transition between outside-the-office portable and inside-the-office computer while providing you with the kind of connectivity and expansion you'd only expect from a desktop.

You'll find it truly leaves nothing to be desired.

For product literature or location of your nearest dealer call 1-800-NEC-INFO.

PC UTILITIES UPDATES

Like all good software, the programs presented in *PC Magazine* are upgraded and improved. You can obtain these modified versions only by downloading them from PC MagNet. Here is a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities:

ANSI.COM, Version 1.3
 BAT2EXEC.COM, Version 1.3
 BCOPY, Version 1.2
 BEN56.ARC (Benchmark Series, Version 5.6)
 CARDFILE.COM, Version 1.1
 CHKFRAG.EXE, Version 1.2
 CMDEDIT.EXE, Version 2.01
 CONFIG.CTL, Version 3.0
 DIRMATCH.COM, Version 1.1
 EMMA.COM, Version 2.2
 LASERLST.COM, Version 1.1
 LITES.COM, Version 1.1
 PANDORA.COM, Version 1.5a
 PCACCESS.COM, Version 1.1
 PCMANAGE.EXE, Version 1.1
 PCREMOTE.COM, Version 1.1
 RN.COM, Version 2.0
 SCHEDULE.COM, Version 1.1
 SLICE.COM, Version 1.3
 SNIPPER.COM, Version 1.2
 TPFST-AT.COM, Version 1.1
 ZCOPY.COM, Version 1.2

For a complete list of all the programs available from the PC MagNet Utilities Database, download UDCAT.ARC.

A downloadable index to *PC Magazine's* product reviews is also available. PCM.EXE is a self-extracting file that contains the *Computer Library PC Magazine Reviews Index* for January 1988 to June 1990. It requires the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any of these files.

Please note that the programs available on PC MagNet can be copied but are copyrighted. You may make copies for others as long as no charge is involved, but making copies for any commercial purpose is prohibited.

Photocopy this page. Trim and hole-punch the copy and add it to your manual.



CDX Command

Michael Holmes and Bob Flanders

April 30, 1991 (Utilities)

Purpose:

An alternative to the DOS CD command that eliminates the need to enter long path and directory names and finds and changes to directories containing specified filenames.

Format:

**CDX [/B] [/+] [/F filename] [d:]p1
 p2...pn**

Remarks:

Entered without any of the optional / switches, CDX searches one or more hard disk drives *d*: for a specified directory *p1*. If found, the full path is displayed with a ? prompt and is selected by typing Y; typing N continues the search for another qualifying directory. If the *d*: parameter is omitted, only the current drive is checked; *: searches all hard disk drives, starting with C:. Multiple drives listed as *d*:, including floppy disk drives (if desired) are searched in named order, for example, DCAB:. If *d*: is preceded by a minus sign (-) the drive(s) listed are excluded rather than included.

The *p1* target directory names can be truncated to as little as their initial letter. To prevent having to bypass an inconvenient number of qualifying directories at the ? prompt, multiple values of *p*, each separated by a space, can be used to construct an abbreviated path, which need not include all steps. If the initial *p1* begins with a backslash (\), the search will be made from the root rather than from the current directory.

Any optional / switches used on the CDX command line must precede the *d:p1* parameters. Using the /F switch limits qualifying directories to those containing a user-specified *filename*. The *filename* supports the * and ? DOS wildcards, and if all the subdirectories of *d*: are to be searched, *p1* may be omitted or replaced by an asterisk (*). Supplying the /B switch automatically selects the first qualifying directory, eliminating the user prompt. The /+ switch includes floppy disk drives A: and B: in the search. Entering only CDX brings up a syntax help screen.

Entering CDX with a single dot parameter simply displays the current directory. CDX .. changes to the parent directory, and CDX \ changes to the root directory of the current drive.

Note:

To change to the root directory of a different drive using CDX requires using a single space as the value of *p1* immediately following the backslash. Thus, **CDX /B E: ** will change to the E: root directory without an intervening prompt.

Utilities

ry at a time until you reach the root and search the drive from that point.

■ If the target is still not found, search all other specified drives sequentially, starting with C:, unless another search order is specified. In that case, begin directly with the first specified drive rather than with the current drive.

■ If the /F switch is specified, a directory qualifies only if a file matching the provided specification exists in the directory being tested.

TECHNICAL TOPICS

When first entered, CDX looks at all the command line parameters and determines whether a search is needed, what options were selected, which drives are to be searched, and the order of search to follow. It then saves the current drive in case the target directory is not found, whereupon it returns to the starting point.

Three subroutines do the main CDX processing. The `srch_drv()` routine directs the search on a particular drive by saving the current directory of the requested drive, executing the search, and restoring the current directory if the target is not found. This routine is also responsible for executing searches in directories above the current directory on each drive. It returns to the caller only if the target directory is not found.

The `cdxlook()` routine searches for the target directory in and below the requested directory on the current drive. This is the most interesting routine, because it uses a recursive algorithm (an algorithm that calls itself) to search the directories for the target. When the search starts, the current drive and directory have been set by `srch_drv()`.

When `cdxlook()` is called from `srch_drv()`, it is passed a pointer to a string telling it the directory in which to begin looking and a pointer to a directory name to look for. In addition, `cdxlook()` references global variables that indicate the directory where the search began, the pointers to the command line parameters, how many parameters were entered on the command line, and the current parameter being processed. The routine then asks the following questions: Does the subdirectory I am looking for exist in the requested directory? and Does the file specified (if any) exist?

If the current parameter is the last one entered on the command line and the requested file is found, a block representing the qualifying directory is built and placed in a queue of prompts to be issued to the user. Searching continues and subsequent prompt blocks for qualifying directories are queued.

As each directory is searched, CDX checks to see whether the user has responded to the prompt. If so, and if the answer is Y, it changes to the indicated directory. If it's N, the block is freed and the next prompt is issued. When no prompt blocks are available, a message is displayed indicating the search is continuing.

When CDX is not working on the last parameter entered, `cdxlook()` builds a new "where to begin looking" operand (the directory just found) and calls itself with the next parameter on the command

**When you aren't sure
where a file or a
subdirectory is, or
you want to go directly
to a directory that has a
long pathname, CDX
will find it for you and
save many keystrokes
in the process.**

line. This is one of the recursive aspects of the algorithm, and implements the ability to find a directory based on a few characters of the directory name.

If the target directory is not found, `cdxlook()` continues searching for any qualifying directories below the directory last searched. If any directories are found, it calls itself to search them for the target directory. This aspect of the recursive algorithm implements the finding of non-contiguous directories. Let's use Figure 1 as an example again. If you enter CDX C:ACCTPAYB 1990, you'll find all the directories beginning with 1990 that appear in the tree beginning with ACCTPAYB, whether or not they are directly be-

low ACCTPAYB (contiguous) or separated by one or more directories (non-contiguous).

It's important to remember that `cdxlook()` executes the same code whether it calls itself or is called by `srch_drv()`. In either case, CDX has two ways of finishing. If it finds that its target is accepted by the user, it changes to the target directory and returns to DOS. If it does not find its target (the target does not exist in or below the requested directory), it returns to the caller.

Finally, the `cdxdir()` routine finds a matching subdirectory entry in the requested directory. When `cdxdir()` is called, it is passed the fully qualified search string (for example, \INVOICES\SEP*.*) . On the first call, it uses the `_dos_findfirst()` to determine whether any matching entry exists. If so, it returns a true, indicating that a match was found. In subsequent calls it uses the `_dos_findnext()` call to locate additional entries. One additional note about this routine is that it skips the . and . . entries found in subdirectories. Since these represent the current directory and the parent directory, they are not needed and could only confuse the search algorithm. When `cdxdir()` finds no more matching entries, it returns a false.

IN CONCLUSION

CDX is not a total replacement for the DOS CD command. The CD command will tell you the current directory of another drive; CDX will tell you only the current directory on the current drive. Further, CD can be used to create a null file. You can do this by entering the command

```
CD . >EMPTY.FIL
```

This procedure tells DOS to change to the current directory and to place the displayed results in the file EMPTY.FIL. Since no output is produced by this command, EMPTY.FIL contains zero bytes. The same command to CDX places the header message in the output file.

Nevertheless, when you aren't sure where a file or a subdirectory is, or you want to go directly to a directory that has a long pathname, CDX will find it for you and save many keystrokes in the process.

Michael Holmes is vice-president and senior systems analyst and Bob Flanders is president and senior systems analyst of NCI Systems in Annandale, Virginia. ■



If You Think It Takes This Many Steps To Create A Database, Try Q&A.

Creating a database doesn't have to be a giant struggle. Because with Q&A™ software, you can create a database in two easy steps.

Just type in a list of database items (like Name:, Address:, Price:, etc). Then, tap a function key. That's it. You've created a database that's ready to use.

Q&A is the fastest way to create databases for mailings, invoicing, customer and equipment tracking, expense reports, you name it. And because it's packed with award-winning* power features like multi-file database lookup, sophisticated reporting, and multi-user network support, Q&A is perfect for experts. As well as beginners.

That's why managers at companies like PepsiCo and American Express build their own database solutions the easy way. With Q&A.

Try it today. You'll get database work done fast. And be a big step ahead of everyone else.

FREE DEMO DISK, (800) 228-4122 Ext. 461P
(Ask About the Q&A Trial Size for \$9.95)

SYMANTEC.

*The Database That
Can Do It, Today.*



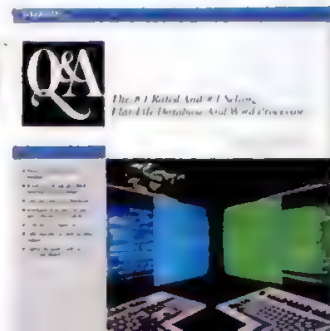
*The #1 Rated And #1 Selling
Flat File Database And Word Processor*

Symantec Corporation, 10201 Torre Avenue, Cupertino, CA 95014 408.253-9600

*Q&A awards: #1 Corporate Satisfaction PC Week 1/89, Software Digest #1 Network File Manager 1/90 and #1 File Manager 2/88, PC World's World Class 9/88 and 10/89, InfoWorld's 1 rating 5/88, PC Magazine Editor's Choice 8/7 and 8/88, and Technical Excellence 1988. Q&A is a trademark of Symantec Corporation.

© 1990 Symantec Corporation

CIRCLE 344 ON READER SERVICE CARD





LANTastic's™ tiny RAM now has more cards to play with.

If the presence of Micro Channel machines has ever stood between you and the joy of running the award-winning LANTastic PC Network, this is your lucky day. Artisoft has just added three new Micro Channel adapters to its compliment of AE-2 Ethernet, 2Mbps and Voice adapters.

LANTastic AE-2 MC Ethernet for Micro Channel, a 16-bit adapter that can be used in either a 16-bit or a 32-bit slot, is in 100% compliance with IEEE 802.3 and Ethernet standards, and comes with on-board 16K RAM that is user expandable to 64K. Since

AE-2 MC Ethernet is software compatible with Novell's NE/2000 hardware, you can run Novell "out of the box."

LANTastic 2Mbps MC adapters



are the perfect way to economically network small or midsize businesses with Micro Channel computers. Each card includes a 10Mhz coprocessor and 32K of on-board dual-ported RAM, along with software-selectable IRQ and RAMBASE address settings. Artisoft's version of the NetBIOS standard can be loaded into and executed within the adapter. This plunges the NetBIOS draw on a PC's base RAM down to just 2K and off loads the network processing onto the adapter. The cards are easy to install and use inexpensive dual-twisted pair cable.

LANTastic Voice MC adapters let you save sound and speech onto disk for playback later on Micro Channel machines. Use them with LANTastic NOS 3.0 or above, and



you can send voice messages across your LANTastic network. Just pick up the telephone handset provided with each Voice Adapter, bring up a handy on-screen menu, and talk. Use Voice Chat to carry on a real time conversation, or save the message for playback later in your own voice — either through the handset or through the Micro Channel machine's internal speaker.

Now it's easier than ever to run LANTastic's award-winning Network Operating System on Micro Channel machines. Call 602-293-6363 or fax 602-293-8065.



ARTISOFT
Revolutionizing Connectivity

CIRCLE 254 ON READER SERVICE CARD

©1990 ARTISOFT. LANTastic is a trademark of Artisoft. Micro Channel Architecture is a trademark of International Business Machines Corporation.



PC MagNet News

The Latest Files and Features of PC Magazine's On-line Service

.ARChived Files Are Now .ZIPped

From this point on, the large *PC Magazine* programs and files on PC MagNet that used to be .ARC format archives will now be .ZIP archives. By changing our archive formats we can reduce the size of the files you have to download, saving you time and money. Archiving files makes it easy for you to download a group of logically related files and lets you compress files so that download time is minimized.

When PC MagNet began to archive files, the standard format was .ARC. In recent years the programs that create .ZIP format archives have gotten much better at compressing files. Our Volume Archive V10N03.ARC was over 133K and took about 10 minutes to download (using a 2,400-bit-per-second modem and the CompuServe B+ file transfer protocol). The exact same file, archived as a .ZIP (V10N03.ZIP) now takes up only 98K and can be downloaded using the same modem and protocol in just 7 minutes.

Users who want to unzip our new archives have a choice of programs. If you just

want to unzip files, you can download a program called UNZIP2.COM from our Utilforum (DL 16). The program is free except for the cost of downloading. If you would like to try out a Shareware program that creates .ZIP files, unzips files, and creates self-extracting archives, you can simply download the program PKZ110.EXE from the same Library.

Participate in a PC MagNet Survey—Free!

One of the proud specialties of *PC Magazine* is the instinct to sniff out new directions and recognize the major trends within the computing industry. One method by which this headway is attained is by monitoring the on-line survey area on PC MagNet.

PC MagNet subscribers who participate in one of our on-line surveys are helping us to recognize some of the market tactics that both the everyday consumer and the industry's leaders should be aware of. Connect charges are suspended while you participate by responding to the variety of penetrating questions from your choice of several different questionnaires.

- **PROCEDURE CHANGE:** All archived files will now be .ZIPped.
- **NO CHARGES:** Fees are suspended while you take PC MagNet Surveys.
- **GEOCLOCK:** See the world in a whole new light.

Instant Access to PC Magazine's On-line Service

PC Magazine operates a 24-hour-a-day interactive dial-up service where readers can find the utilities published in every issue, download an index of all product reviews, share opinions with the editors, and gain access to Computer Library and Consumer Reference Library.

How to Subscribe Right Now!

You can join PC MagNet with one phone call:

1. Choose a phone number by following the directions under "Finding the Number in Your Town" (below).
2. Set your communications software to 300, 1,200, or 2,400 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex.
3. Dial the local number. When you connect, type Ctrl-C.
4. At the HOST NAME prompt, type CIS.
5. At the USER ID prompt, type 177000,5000.
6. At the PASSWORD prompt, type PC*MAGNET.
7. At the ENTER AGREEMENT NUMBER prompt, type Z10D9100.
8. Register your name and enter your MasterCard, Visa, or American Express card number. (If you'd like to have your company billed instead, call CompuServe at 800-848-8990.)
9. Your personal User ID and Password will be displayed at the end of the registration process. Record them for logging on over the next few days; a new password will arrive in the mail within ten days to confirm your subscription.

There are no up-front subscription charges; you pay only for the time you spend on-line. CompuServe members can join by entering GO PCMAG at any CompuServe "!" prompt. CompuServe Customer Service can be reached at 800-848-8990. Outside the United States, call 614-457-8650.

PC MagNet costs \$12.80 an hour for 1,200- or 2,400-bps service, or \$6.30 an hour for 300-bps service. Billing is based on 1-minute increments.

Finding the Number in Your Town

Using your modem: Dial 800-346-3247. When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you.

Using voice: Dial 800-635-6225. Follow the instructions and note the number.

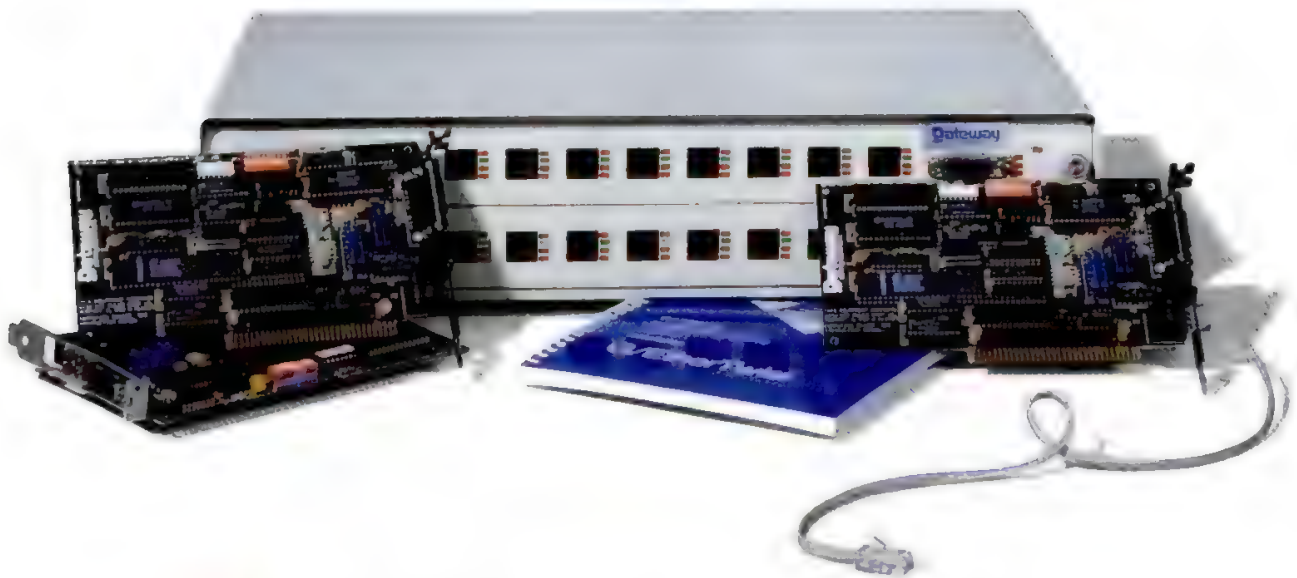
Map Fanatics—Locate Geoclock!

Geoclock is a high-resolution graphical map program that exhibits the current time with an illustration of the earth. The current sun position is displayed and updated every few seconds with the segment of the earth enjoying sunlight shown as highlighted. The local sunrise, sunset, and the

sun's azimuth and elevation are also displayed. A variety of map backgrounds and other options are all included. GEOCLK.ZIP, by Joseph Ahlgren, is in our AFTER-HOURS forum (DL 1), as shareware (\$30). The license gets you extra features and additional maps.



G/Ethernet with a new twist...



G/EtherTwist™

G/Ethernet. Again and again, G/Ethernet has proven its performance by grabbing prestigious industry awards. We're happy about the high-performance that earned *PC Magazine's* Editors' Choice. But happier still are the tens of thousands of satisfied customers that use G/Ethernet every day.

G/EtherTwist™ Now, you can enjoy the same award-winning network performance as G/Ethernet on Unshielded Twisted Pair telephone wire with G/EtherTwist. This family of high-performance UTP adapters received *PC Magazine's* Editors' Choice for 10BASE-T Ethernet LANs. And you still get the flexible, low-cost cabling alternative of UTP telephone wire.



January 31, 1989
G/Ethernet AT



October 16, 1990
G/EtherTwist

G/EtherTwist™ Hubs. Introducing a universal hub for all UTP Ethernet® LANs. G/EtherTwist Hubs provide multi-vendor UTP connectivity, because they are fully compatible with the IEEE 802.3 10BASE-T* specifications for Ethernet LANs.

So, for proven award-winning performance and single-source Ethernet solutions, turn to Gateway Communications. With a full line of G/Ethernet and G/EtherTwist Adapters, you get performance no matter what cable you choose. And all from one source. Call Gateway today!

1-800-367-6555
U.S. & Canada

Gateway
communications, inc.

2941 Alton Ave. • Irvine, CA 92714
(714) 553-1555

*Fully compatible with the IEEE 10BASE-T Draft Ten proposal for Ethernet LANs, and will fully comply with the approved standard. EtherTwist and G EtherTwist are trademarks of Gateway Communications, Inc. Ethernet is a registered trademark of Xerox Corp. Copyright © 1990, Gateway Communications, Inc. All rights reserved.

CIRCLE 148 ON READER SERVICE CARD

by
Charles Petzold

Environments

For several months now I've been discussing color. First we looked at some common color representations and models, then focused on the use of color in the OS/2 Presentation Manager and *Microsoft Windows*.

As is common with most graphics systems, the color model used in both PM and *Windows* is RGB. In this model, a color is represented by intensities of the three additive primaries: red, green, and blue. The RGB model is very convenient, because it directly corresponds to the way color is rendered on color video displays. It also maps in a straightforward way to the CMY (cyan, magenta, yellow) color model used in printing.

Throughout this discussion, I've ignored some basic problems. In truth, the RGB color model is not very device-independent. The problem involves both the way that the human eye perceives light intensity and the way in which color is rendered on output devices.

Even when you're displaying color on a single output device—the IBM 8514/A video adapter and monitor—there are internal inconsistencies in *Windows* 3.0 between normal color selection and color selection using the palette manager.

I want to approach this subject with a brief refresher and then present two programs that are useful for exploring color in *Windows* 3.0. These two programs reveal some peculiar anomalies and indicate that serious work must still be done with color selection in *Windows*.

At first it may seem as if I'm merely uncovering some obscure (and perhaps relatively unimportant) bug in the 8514/A device driver. Bear with me, though—this bug is supposed to be a feature, but the feature is based on some fundamental confusion in *Windows* 3.0.

A SHORT REFRESHER

In its 640-by-480 resolution, the standard VGA adapter uses 4 bits for each pixel and hence is capable of simultaneously displaying 16 pure colors. However, these

Color Complexities And Craziness In Windows 3.0

■ The two programs presented here reveal some peculiar anomalies relating to color selection in *Windows* 3.0.

colors are not fixed by the hardware. The palette lookup table on the VGA board allows each of these 16 pixel-bit values to map to a particular RGB color value sent to the monitor.

Under *Windows* 3.0, the VGA device driver initializes the palette lookup table, and it can't be changed using *Windows* function calls. In the February 12, 1991, installment of *Environments*, I discussed a way to determine these 16 colors using the *GetNearestColor* function. The 16 colors used by *Windows* 3.0 on the VGA are shown in Figure 1.

When a *Windows* application specifies an RGB color for filling an area, *Windows* can approximate it using a technique called *dithering*, which involves displaying a pattern of different-colored pixels to mimic a color not directly available on the video board.

The IBM 8514/A video adapter uses 8 bits per pixel, so it can display 256 simultaneous colors. However, only 20 of these colors are normally used by *Windows* 3.0. These are the 16 colors shown in Figure 1, plus the RGB colors A0-A0-A4, A4-C8-F0, C0-DC-C0, and FF-FB-F0.

The *Windows* 3.0 palette manager gives a *Windows* application access to the other

236 entries in the palette table, as I've demonstrated in recent columns.

TWO COLOR TOOLS

If you plan to be working with color and palettes, two small tools may be helpful. These programs and their source code are available from PC MagNet.

WHATCLR sets the *Windows* timer for 100 milliseconds. Every 100 ms., WHATCLR uses the *GetPixel* function to determine the RGB color of the pixel under the hot-spot of the mouse cursor, and displays the RGB value in its client area. You can use WHATCLR to deter-



Color	Red	Green	Blue
Black	00	00	00
Dark blue	00	00	80
Dark green	00	80	00
Dark cyan	00	80	80
Dark red	80	00	00
Dark magenta	80	00	80
Brown	80	80	00
Dark gray	80	80	80
Light gray	C0	C0	C0
Light blue	00	00	FF
Light green	00	FF	00
Light cyan	00	FF	FF
Light red	FF	00	00
Light magenta	FF	00	FF
Yellow	FF	FF	00
White	FF	FF	FF

Figure 1: In its 640-by-480 resolution, the standard VGA adapter uses 4 bits for each pixel, so it can simultaneously display 16 pure colors. These are the 16 colors used by *Windows* 3.0.

Environments

mine the RGB color of any pixel on the display.

COLORSCR (color scroll) is an enhanced version of the COLORS1 program shown in the second edition of my book *Programming Windows* (Microsoft Press, 1990). The left half of COLORSCR's client area contains three scroll bars labeled Red, Green, and Blue. These scroll bars can be independently adjusted for color values ranging from 00 through FF.

The right half of COLORSCR's client area is divided into three areas:

- The top third shows the pure standard color that corresponds to the selected RGB value. This area is drawn with a brush created using the RGB macro, the GetNearestColor function, and the CreateSolidBrush function.
- The middle third shows a dithered color that corresponds to the selected RGB value. This area is drawn with a brush created using the RGB macro and CreateSolidBrush.
- The bottom area uses the palette manager and displays a pure color corresponding to the selected RGB value. Only a

single entry in the logical palette is required. The entry is set to the selected RGB value, the logical palette is selected in the device context and realized, and the area is drawn with a brush created using the PALETTEINDEX macro and the CreateSolidBrush function. (When COLORSCR runs with a video adapter and driver that don't support the palette manager—such as the standard VGA—this area will be drawn using a dithered color.)

In the discussion that follows, I'll refer to these three colors as the pure standard color (top), dithered color (middle), and pure palette color (bottom).

In theory, when this version of COLORSCR runs on an 8514/A, the dithered color should be close to the pure palette color. The two colors won't match exactly, of course, but they should give the general impression of being the same color. However, after experimenting with COLORSCR, you'll soon note that these colors often vary widely.

You can use COLORSCR in conjunction with WHATCLR to explore how dithering is implemented. (You'll find this easier if you also use the BLOWUP1 program in *Programming Windows* for capturing a small area of the dithered color.) And here you'll start to see some peculiar anomalies.

HOW DITHERING WORKS

Let's assume you run COLORSCR on an 8514/A and leave the green and blue values set to 00. You can then change the red value from 00 to FF.

The dithered colors you'll see consist of a pattern that combines various densities of black (00-00-00), dark red (80-00-00), and light red (FF-00-00) pixels. At

its largest, this pattern consists of 32 pixels repeated over the colored area. Figure 2 shows the proportions of black, dark red, and light red pixels in the dither pattern for selected red values. I've left gaps in this table, but it's easy to see the progression of values.

Varying blue with red and green set at 00, and varying green with red and blue set at 00 produces similar results. Things get more complex when red, green, and blue are varied indiscriminately.

PECULIARITIES AND ANOMALIES

Now let's look at some screenshots that reveal some of the peculiarities of dithered colors and pure palette colors. Figure 3 shows COLORSCR set to an RGB color value of 40-00-00, which should be one-fourth of the full red intensity.

The pure standard color at the top is dark red (80-00-00), which most closely approximates 40-00-00. The dithered color uses half black pixels and half dark red pixels, as seems appropriate. However, the pure palette color obtained from loading 40-00-00 into the palette table is a much darker red, and it may almost appear to be black. As you can see, there is a big inconsistency between dithered colors and pure palette colors at this level of red.

In Figure 4, COLORSCR is set to an RGB of 80-00-00, or half the full red intensity. Again, the pure standard color is dark red. In the center, dithering is not required, so the color is also dark red, matching the pure standard color.

But what happened to the bottom third of the display? The program has loaded 80-00-00—supposedly dark red—into the palette table, but the color is darker than the normal dark red! Even stranger,

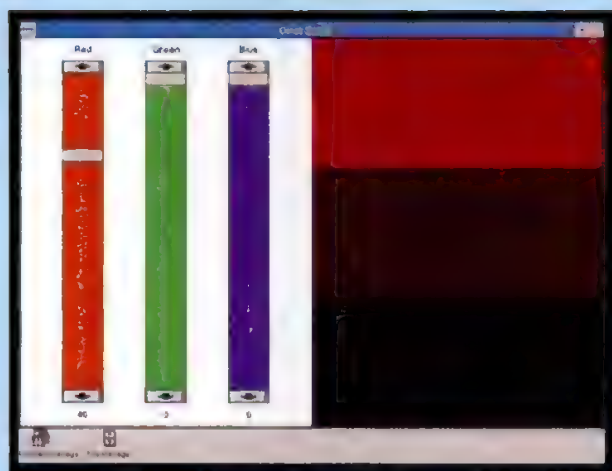
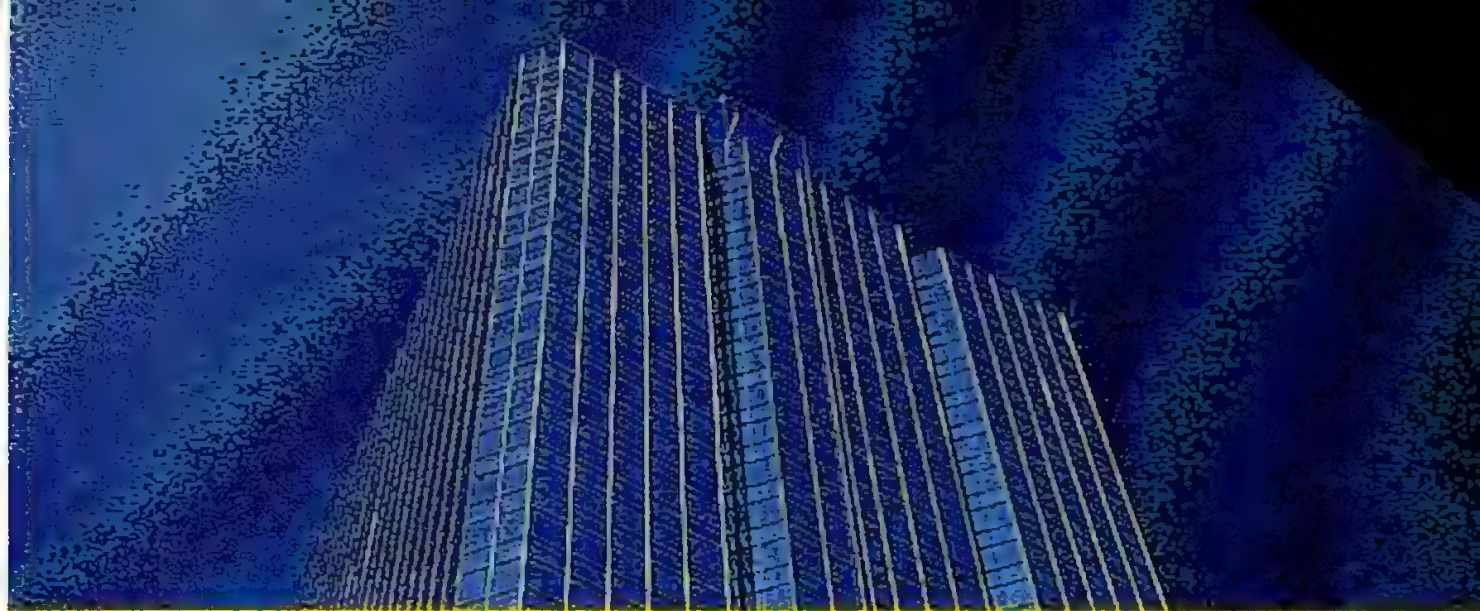


Figure 3: COLORSCR running on an 8514/A under Windows 3.0 with an RGB value of 40-00-00.

PC DITHERING PROPORTIONS FOR SELECTED RED VALUES

Red value	Black	Dark red	Light red
00 to 02	32	0	0
03 to 06	31	1	0
07 to 0A	30	2	0
0B to 0E	29	3	0
0F to 12	28	4	0
...	...	...	...
3F to 42	16	16	0
...	...	...	...
77 to 7A	2	30	0
7B to 7E	1	31	0
7F to 82	0	32	0
83 to 86	0	31	1
87 to 8A	0	30	2
...	...	...	...
BF to C2	0	16	16
...	...	...	...
F7 to FA	0	2	30
FB to FE	0	1	31
FF	0	0	32

Figure 2: These are the dithering proportions used in representing shades of red on an 8514/A under Windows 3.0.



Your business is safe with us.
No matter how big it gets.



We're ready right now with a 4 megabyte diskette for your 4 megabyte drive—a new product for the next generation of expanding data storage. We're ready when you are—in any size, capacity or format you need.

That's why more business protects important information on 3M brand diskettes and data cartridges than any other brand in the world.

Call 1-800-888-1889 ext.6 to find out more.

Innovation working for you™

4 mb diskettes require compatible drives. ©3M 1991.

CIRCLE 521 ON READER SERVICE CARD



3M | 
Worldwide Sponsor 1992 Olympic Games
36USC380

Seagate and Novell Join Forces for First NetWare Ready® Disc Drives.

It shouldn't surprise you. Seagate and Novell together announce an important new development in storage for network computing. The first NetWare Ready® disc drives. NetWare Ready Wren® disc drives from Seagate.

Now truly NetWare Ready drives can be



installed in minutes in network file servers for Novell systems. That saves you from the time and expense of lengthy CompSurf processing.

Only NetWare Ready Wren drives pass demanding lab tests by technical quality teams at both Seagate and Novell. The result is a special factory-recorded NetWare Ready signature that is immediately recognized by NetWare operating systems.

Not only have these drives undergone months of Novell's rigorous lab testing requirements, but Seagate's automated manufacturing and test processes ensure that every drive shipped meets the NetWare standard.

Our family of NetWare Ready Wren drives is available now in 376 and 766 megabyte capacities. An additional series of Wren SCSI, half-height and full-height models – from 125 to 1,200 megabytes – is currently undergoing NetWare Ready qualification.

When Seagate and Novell join forces, NetWare operating system installers and managers now know that two tough quality standards have just made life easier.



For complete details, call Seagate at 800-468-DISC or 408-438-6550.

We're ready when you are.

 **Seagate**
The first name in disc drives

Novell, NetWare and NetWare Ready are registered trademarks of Novell, Inc. The NetWare Ready logo is a trademark of Novell, Inc. Seagate and the Seagate logo are registered trademarks of Seagate Technology, Inc. © 1990 Seagate Technology, Inc.

Environments

WHATCLR reveals that all three areas contain pixels of an 80-00-00 RGB value, though the bottom area is obviously darker. Something is wrong here.

While you're pondering that, take a look at Figure 5, which shows COLORSCR set to an RGB value of C0-00-00, three-quarters the full red intensity.

The pure standard color at the top is now light red (FF-00-00). The dithered color in the middle uses half dark red and half light red pixels. The color at the bottom (set by loading C0-00-00 into the palette table) now looks like the standard dark red pure color—as you can see by comparing it with the colors in the top third of Figures 3 and 4.

What's really peculiar is that WHATCLR reports that the bottom third of COLOR-SCR is colored with an RGB value of 80-00-00, not C0-00-00. If you set the color to BF-00-00 or C1-00-00, WHATCLR reports it correctly. But if it's set to C0-00-00, WHATCLR reports 80-00-00, even though there is no apparent discontinuity at this value.

Finally, Figure 6 shows COLORSCR set to an RGB value of FF-00-00, which is full red intensity.

All three areas show light red, WHATCLR reports that each of them has pixels of color FF-00-00, and finally there are no anomalies or peculiarities.

TRICKERY REVEALED!

Something strange is going on here, but I think I know what the problem is.

Figure 1—showing the RGB values of

the 16 standard colors—is not based on the RGB values actually loaded into the hardware palette table on the 8514/A video board. The dark colors (except for dark gray) are actually rendered using intensities of C0 rather than 80. You can verify this with the `GetSystemPaletteEntries` function, which returns a table directly corresponding to the state of that hardware palette on the video board.

This implies that selecting colors using the *Windows* 3.0 palette manager is not consistent with selecting colors normally in *Windows*, and it's one reason the dithered colors are often quite different from the pure palette colors.

For the 8514/A, the system palette table contains 256 entries. As you can see in Figure 7, the 20 reserved entries are at the bottom and top of the palette table so that mix modes work correctly for the 16 standard colors.

If you use the palette manager to load

a desired color into the system palette, you can select that color using either the `PALETTEINDEX` macro or the `PALLETTERGB` macro. You can continue to select a standard dithered color using the `RGB` macro.

If you load the system palette with C0-00-00, brushes created using

```
RGB (0x80, 0, 0)
```

and

```
PALETTERGB (0xC0, 0, 0)
```

will produce the same color on the 8514/A display. The color selected using the `RGB` macro is actually the second color in the system palette—C0-00-00. That's why the bottom third of Figure 5 is the same as the top two-thirds of Figure 4.

If you load the system palette with 80-00-00, brushes created using

```
RGB (0x80, 0, 0)
```

and

```
PALETTERGB (0x80, 0, 0)
```

will be different. The palette color 80-00-00 is darker than the standard dark red, because the standard dark red corresponds to a palette entry of C0-00-00. And that's why the bottom third of Figure 4 is darker than the top two-thirds.

Somewhere in *Windows* 3.0, `GetPixel` is fudged—when it reads a pixel that maps to the palette entry of C0-00-00, `GetPixel` returns 80-00-00 (and correspondingly for all the other dark colors). This allows the basic color functions in *Windows* 3.0 to

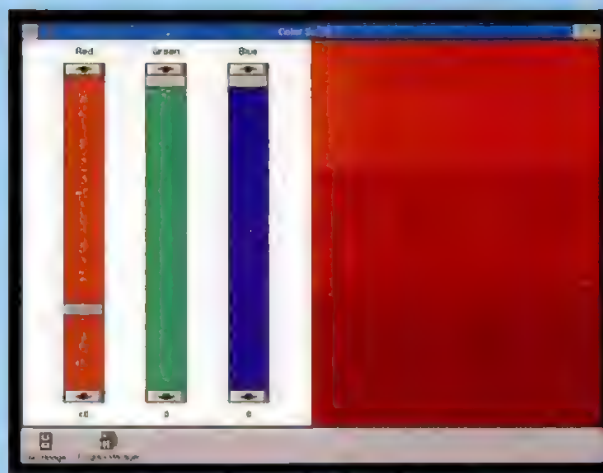


Figure 5:
COLORSCR
running on an 8514/A
under *Windows*
3.0 with an RGB
value of C0-00-00.

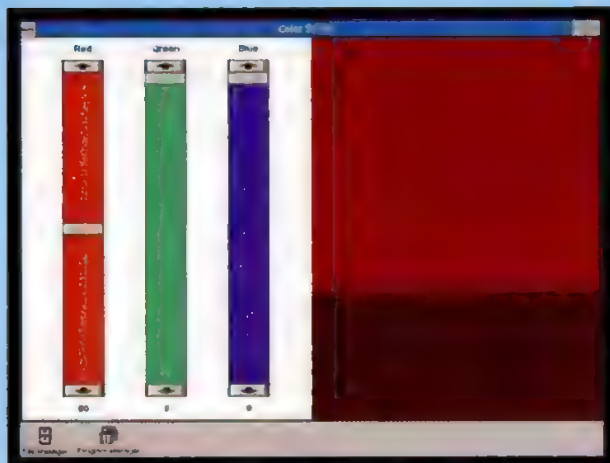


Figure 4:
COLORSCR
running on an
8514/A under
Windows 3.0 with
an RGB value of
80-00-00.

Environments

be consistent. The only problem is that they are not consistent with colors selected using the palette manager.

If *Windows 3.0* can't even maintain internal consistency in color selection, how can it hope to render consistent colors on different output devices?

GAMMA CORRECTION

When a *Windows* application specifies an RGB color value of 80-00-00, you should perceive a level of red intensity that is half the maximum red intensity. (Of course, people may disagree on what "half red intensity" looks like, and that's one of the problems.) The value that *Windows* actually loads into the hardware palette register should be the value that gives this perceived half red intensity, which may not be the RGB value 80-00-00.

My best guess is that the *Windows* developers attempted to compensate for this difference in the definition of the standard color values (that is, using a palette value of C0-00-00 for the RGB color value of 80-00-00) but this was not carried over into the palette manager.

It's possible that the palette values for the standard color values are based on something called *gamma correction*. Gamma correction corrects for nonlinearities in the relationship between electron density and light intensity on a video display. (Gamma correction is discussed on page 564 of the second edition of *Computer Graphics: Principles and Practice*, by James Foley, Andries van Dam, Steven Feiner, and John Hughes (Addison-

Wesley, 1990).)

The electron density on a video display is proportional to grid voltage, which in turn is proportional to the color voltage delivered to the monitor, and that, in turn, is proportional to the color value loaded in the palette register of the video board. If both the light intensity and the voltage are normalized to range from 0 to 1, then the relationship between light intensity and the voltage can be expressed by the formula

$$V = I^{(1/\gamma)}$$

where γ (gamma) is typically between 2.2 and 2.5 for video displays. Let's take the average of 2.35. To achieve half the light intensity, the voltage must be

$$V = .5^{(1/2.35)}$$

or 0.7458 of the maximum voltage.

Because these voltages are based on palette values ranging from 00 to FF, the required palette value is BE, which is close enough to C0 to confirm that gamma correction probably is being used in the system palette table for the standard *Windows* colors.

But this is still not adequate. Human



THE 8514/A SYSTEM PALETTE TABLE UNDER WINDOWS 3.0

System palette index	Red	Green	Blue	Color
00	00	00	00	Black
01	C0	00	00	Dark red
02	00	C0	00	Dark green
03	C0	C0	00	Brown
04	00	00	C0	Dark blue
05	C0	00	C0	Dark magenta
06	00	C0	C0	Dark cyan
07	C0	C0	C0	Light gray
08	C0	DC	C0	
09	A4	C8	F0	
0A-F5	Unused			
F6	FF	FB	F0	
F7	A0	A0	A4	
F8	80	80	80	Dark gray
F9	FF	00	00	Light red
FA	00	FF	00	Light green
FB	FF	FF	00	Yellow
FC	00	00	FF	Light blue
FD	FF	00	FF	Light magenta
FE	00	FF	FF	Light cyan
FF	FF	FF	FF	White

Figure 7: For the 8514/A, the system palette table contains 256 entries. Note that the 20 reserved entries are located at the bottom and top of the palette table so that mix modes work correctly for the 16 standard colors.

visual perception of light intensity is not linear but logarithmic. *Computer Graphics* presents a good example: "Cycle through the settings on a three-way 50-100-150-watt light bulb; you will see that the step from 50 to 100 seems much greater than the step from 100 to 150."

If you want 256 levels of light intensity, each step of which appears perceptually about the same, then the intensities (again, normalized to range from 0 to 1) should be calculated as

$$I_j = I_0^{(255 - j) / 255}$$

where j ranges from 1 to 255. I_0 is typically between 0.005 and 0.025. Let's take an average of 0.015. For a half red perceptual intensity, the light intensity must really be

$$I_{128} = 0.015^{(127 / 255)}$$

or about 0.1235 of full intensity. The voltage must therefore be

$$V = 0.1235^{(1/2.35)}$$

or 0.4106 of the maximum voltage. This translates to a palette value of 69 (hexadecimal), much lower than the value of A0 that is actually used in *Windows 3.0*, and closer to the value of 80 if no trans-

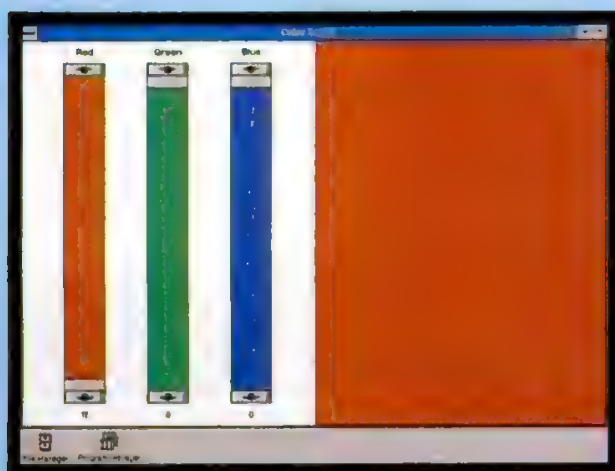


Figure 6: COLORSCR running on an 8514/A under *Windows 3.0* with an RGB value of FF-00-00.

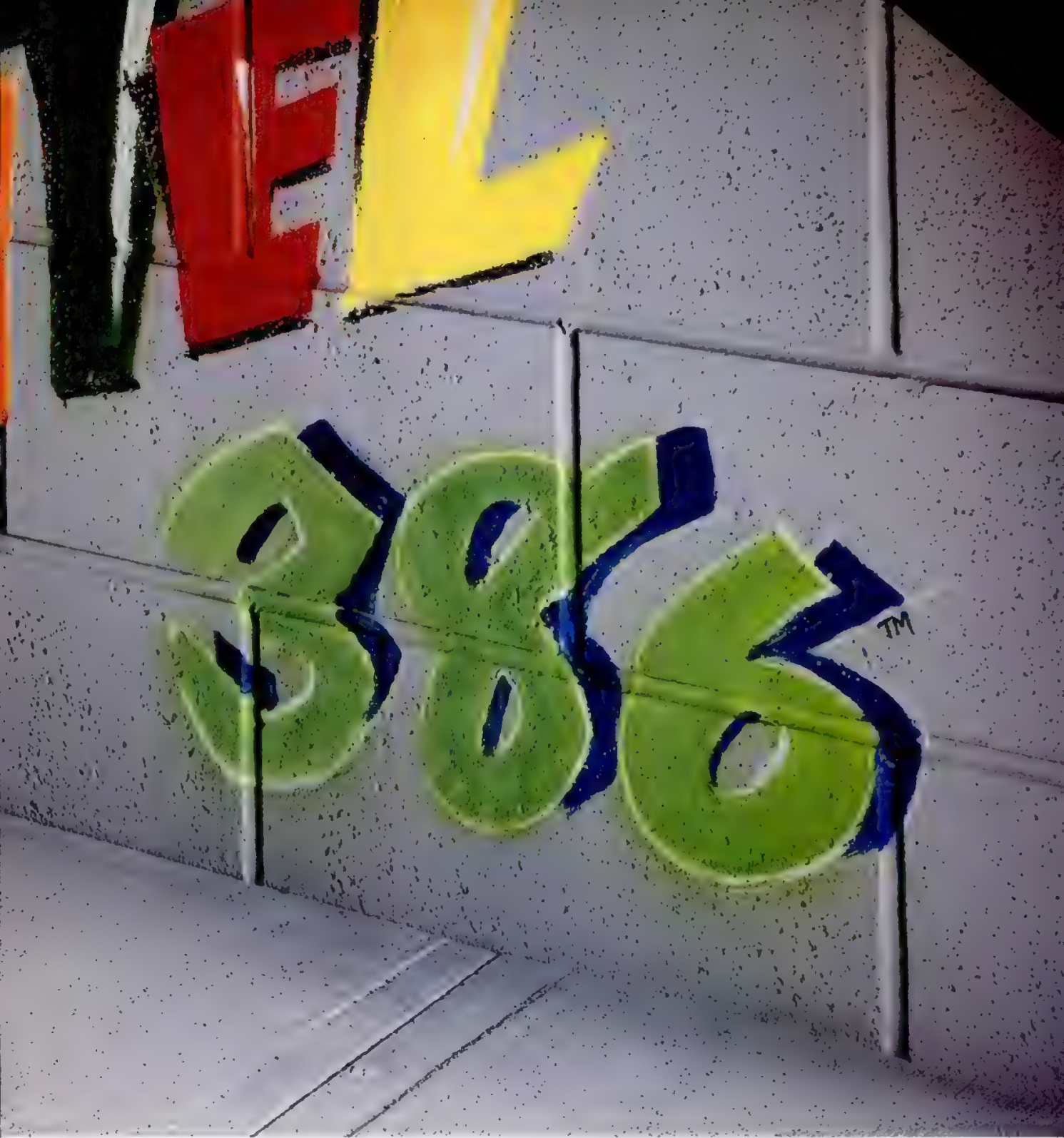


MATH! COPROCESSORS

You know what you need
to speed up your



Only one math coprocessor is a
chip off the old block.



facility, and then tested and retested against an exacting set of criteria.

And we can guarantee that every Intel Math CoProcessor lives up to the industry hardware standards we helped develop, delivering the same results regardless of what type of computer you're doing calculations on.

So call Intel at (800) 538-3373. Ask for

Literature Packet #F6 on Intel's new and improved Math CoProcessors. And put an Intel Math CoProcessor inside your computer. It's the only one with the Intel name to live up to.

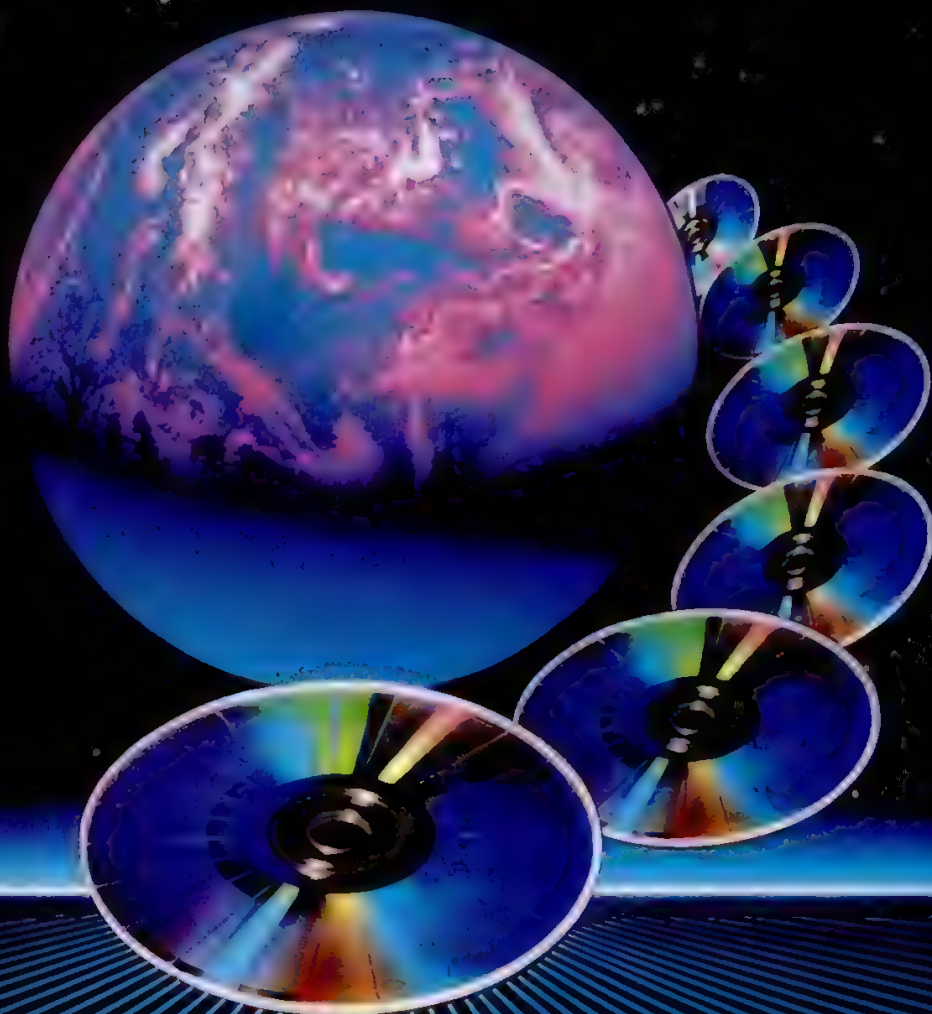
intel[®]

The Computer Inside.™

CIRCLE 512 ON READER SERVICE CARD

©1990 Intel Corporation. 386 and 387 are trademarks of Intel Corporation.

NOVELL
SUPPORTS
NetWare 386 File Servers!



World-class Optical Storage for Novell

COREL announces the finest in data security and mass storage for Novell networks. As the world's leading developer of optical interface software for IBM and Macintosh computers, COREL brings you its award-winning line of optical disk sub-systems, the most powerful NetWare compatible optical drives on the market today. Whether you need the permanence of WORM storage, the convenience of erasable optical or the power and flexibility of our new multi-function drive, COREL offers you *the most flexible and effective storage solutions anywhere*, providing massive archiving capabilities and exceptionally high security options.

COREL software is completely compatible with Novell NetWare utilities, security levels, and all existing applications. The world's leading developer of optical disk interface software invites you to make the networking breakthrough. For details, contact COREL Systems today!



TEL:(613)728-8200
FAX:(613)728-9790

Corel Systems Corporation: the universal choice for optical innovation.

Environments

lation were being used at all.

This seems in accordance with my conclusions from sustained experience with COLORSCR. The standard *Windows* dark red color is much too light. Loading a value of 80-00-00 seems much closer.

I've written a program called GAMMARED that puts the above formulas into practice. The program displays 64 shades of red with corrections to the palette values based on the two formulas shown above. I've chosen typical values of γ and I_{00} , although correct values should be based on the monitor being used. This program displays a continuous fountain of reds that appears to have perceptually equal increments in light intensity, which is not the case when you load the palette table with uncorrected values.

NO SCREENSHOT!

I haven't included a screenshot showing GAMMARED running on an 8514/A under *Windows* 3.0, because it wouldn't look correct at all. (You can download the program from PC MagNet, though.) My *Windows* screen-capture program interrogates the system palette table and uses that as a color table in a *PC Paintbrush* (.PCX) file, which the magazine sends out for conversion to four-color offsets for printing. The RGB values in the system palette table have been corrected for an average video display, and they'd be wrong for printing.

This raises another problem, of course, which is the very different ways color is rendered on video displays and color printers. Printing uses inks of the subtractive primaries (cyan, magenta, and yellow) along with black (which produces a better black than a combination of cyan, magenta, and yellow). Particular colors are rendered with a technique called *half-toning*. The image is composed of equally spaced dots whose size varies depending on the density of the primary. Half-toning has its own nonlinearities.

The process of matching color has been a problem for many, many years. In the publishing industry, the colors produced by Pantone have been a de facto standard, although they aren't categorized in a way that allows them to be easily used by computer applications.

More recently, other color models have been proposed that may provide more

device independence in color selection. For example, a color model known as YCC has been recently proposed by Kodak, and it seems to be generating some industry interest. This color model is based on the phosphors used on an HDTV (high-definition television) screen.

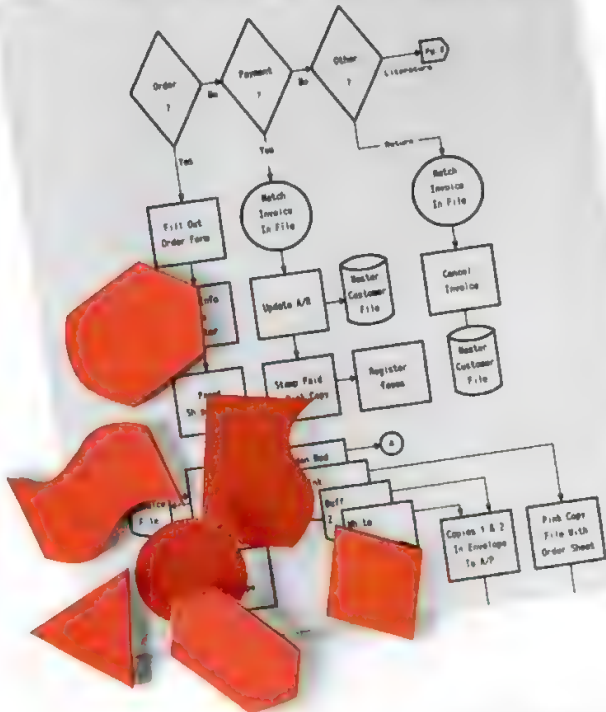
SOME BETTER WAY

Whenever the *Windows* developers at Microsoft discuss future enhancements

for *Windows*, they usually vaguely suggest "some better way of specifying color in a truly device-independent manner." I'll second that!

So, the challenge is out. If Microsoft is truly serious about providing a growth path for *Windows*, let's see it develop a color model that gives us consistent, well-defined, device-independent color selection. The current problems and internal inconsistencies are intolerable. ■

BUILD TO SUIT.



Now, you can create, update and print presentation-perfect flowcharts to your specifications — in no time!

Quick to master and a snap to use, Patton & Patton's flowcharting software is the standard of both large and small businesses around the world — and is available through all major software dealers.

See your dealer today! Or, for a "live," interactive demo disk, call:
800-525-0082, ext. 2304.
International: 408-778-6557, ext. 2304.



PATTON & PATTON
Software Corporation

Excellence in charting the flow of ideas!

Works on IBM & 100% compatible PC's, supports CGA/EGA/VGA and over 150 dot matrix and laser printers, with multiple print densities and 10 font sizes. **Creates multi-page charts, portrait or landscape, on most standard paper sizes.** Mouse or keyboard controlled. Supports International Characters.

IBM is a registered trademark of International Business Machines Corporation.

CIRCLE 301 ON READER SERVICE CARD

Before you run out and spend five or six thousand dollars for a 386SX notebook PC, we seriously suggest you take a close look at Samsung.

We've just introduced the NoteMaster[®] 386S/16. It has the features of a Compaq notebook PC for about half the price.

NoteMaster has a better screen, a more responsive keyboard and can be upgraded with a coprocessor, modem or more memory without even opening up the case. It's also slimmer and lighter than Compaq. And it comes with our toll-free customer service hotline so you get answers directly from our product experts. As one of the world's largest manufacturers, we make most of our own components, so you realize considerable savings with superior quality control.

Call 1-800-624-8999, extension 85 for more information or the name of your nearest dealer.

You'll discover you can own the best without paying the most.

	Samsung NoteMaster 386S/16	Compaq LTE 386/20
Processor	16MHz 386SX	20MHz 386SX
Dimensions	8.5" x 11" x 2.1" 7 lbs.	8.5" x 11" x 2.2" 7.5 lbs.
Display	VGA Sidelit CCFT Paper White VGA LCD 256KB Video RAM 64 grey shades support	VGA Edgelit LCD 16 grey shades support
Keyboard	Standard AT-compatible 3mm key travel depth	Enhanced keyboard 2.5mm key travel depth
Memory	1MB expandable to 5MB	2 MB expandable to 10MB
Software Incl.	Laplink III MS-DOS Windows 3.0	Not available
Support	Toll-free 800 number On-line modem support	Not available
Price	20MB - \$3999 40MB - \$4499	30MB - \$6499 60MB - \$6999

 **SAMSUNG**
Technology that works for all of us.

Lower your budget not your expectations.



All brand and product names are Trademarks or Registered Trademarks of their respective companies. Copyright 1990 Samsung Information Systems America, Inc.

CIRCLE 316 ON READER SERVICE CARD

by
Ray Duncan

Power Programming

Exploring Dynamic Data Exchange in Windows 3.0 with WordBASIC

Microsoft Windows 3.0 has been topping the software best-seller lists for almost a year now, and Windows applications are springing up on the shelves of software stores like mushrooms after a Redmond rain. The array of available Windows freeware and shareware is also becoming quite impressive; after I first installed Windows 3.0, I spent several entire evenings downloading Windows utilities, games, and applications from the Microsoft Forum on CompuServe. Some of these programs are truly splendid; for example, you can easily lose yourself for hours in *Fractint for Windows*, written by Bert Tyler and others in the "Stone Soup Group." This is a terrific program, which renders over 60 different fractal formulas with assorted options and doodads.

Whenever I use one of these outstanding Windows programs, however, I feel obligated to bow my head in respect to the pioneer software developers who brought these programs to completion without losing their sanity. I observe an additional moment of silence for the programs that never came to fruition, because their authors gave up in exasperation. Until very recently, essentially all serious Windows coding was executed in Microsoft C with the aid of the Windows Software Development Kit (SDK), a programming environment that only a half-crazed Unix shell script hacker could love. The SDKs for Windows, Versions 1 and 2, were notoriously programmer-hostile, consisting of a hodgepodge of C header files, an assortment of character-oriented, arcane, and unforgiving tools such as the Dialog Editor and Resource Compiler, a debugger with so many problems of its own that it was almost more trouble to use than it was worth, and over a thousand pages of opaque documentation.

In the Windows 3.0 era, the outlook for application developers is not quite so grim. Advocates of object-oriented programming can choose between Whitewater Group's Actor and Smalltalk systems from ParcPlace or Digitalk, while a ver-

sion of Turbo C++ for Windows is rumored to be on the way from Borland as well. Multimedia databases can be created in Asymetrix ToolBook or the other Windows-based HyperCard clones, and data entry applications can be put together quickly with Borland's ObjectVision. High-level, if frighteningly expensive, CASE program generators are also available.

But the developer who is unwilling to abandon traditional procedural languages is still faced with a paucity of modern tools and a huge learning curve. Although the Windows 3.0 SDK has been greatly improved, delving into it is still more like a demented game of Adventure than an experience in software engineering. For all that, the SDK is only usable by C programmers—it's common knowledge that Pascal, FORTRAN, Modula II, and BASIC programmers can't join the party.

Or can they? In this case, common knowledge isn't quite correct. An interactive, integrated BASIC programming environment for Windows has been available for some time—predating, in fact, the release of Windows 3.0. Only this programming environment is not exactly

■ One very powerful aspect of WordBASIC is that it is a wonderful test-bed for Windows' only true interprocess communication mechanism, Dynamic Data Exchange.

in an obvious place—it's concealed within Microsoft's *Word for Windows* as its macro language, WordBASIC. I find it ironic that Microsoft, which prides itself on its reputation as a tools developer and an evangelist for graphical user interfaces, has not managed to produce any GUI-based programming language for DOS in the six years since Windows' original release except for one buried in a word processor! An interesting sidelight is that WordBASIC is fully functional on the Working Model *Word for Windows* disk, which Microsoft essentially gives away to anyone who asks for it.

THE WORDBASIC PROGRAMMING LANGUAGE

In many respects, WordBASIC closely resembles Microsoft's QuickBASIC languages for MS-DOS and the Macintosh, and I suspect it's implemented with the same threaded-code technology. (Threaded code is similar to pcode, but consists of lists of addresses of routines to be executed rather than arbitrary tokens.) WordBASIC is moderately well structured (compared with traditional BASIC interpreters, anyway); it uses no line numbers and relies for its flow of control on free-form, alphanumeric labels and the following constructs:

```
IF ... ELSE ... ENDIF
FOR ... NEXT
SELECT CASE ... END SELECT
WHILE ... WEND
CALL
SUB ... END SUB
FUNCTION ... END FUNCTION
```


Power Programming

The inevitable BASIC GOTO is still supported, but its use is discouraged. WordBASIC's repertoire of string and file functions is quite conventional. There are three important ways in which WordBASIC is customized for *Word for Windows* and differs from its QuickBASIC ancestors:

- WordBASIC is extremely weak in mathematical functions, supporting only addition, subtraction, multiplication, division, MOD, INT, ABS, RND, VAL, and SGN (which returns -1, 0, or 1, indicating the sign of a number). All variables are assumed to be floating-point; there is no way to declare integer variables to save memory or improve execution speed.

- To balance its lack of mathematical ability, WordBASIC provides several hundred unique commands and functions oriented toward word processing. These map onto the various *Word for Windows* menu selections and formatting options. For example, the WordBASIC command EditCopy is exactly equivalent to the Copy command on *Word for Windows*' Edit pull-down menu; it places a copy of the currently selected text on the *Windows* clipboard.

- Text input and output with the traditional BASIC INPUT\$ and PRINT statements are confined to the *Word for Windows* status bar. The PRINT USING command is not supported at all. Somewhat more flexibility is offered by the MSGBOX command and the INPUT-BOX\$() function; however, the best re-



WORDBASIC'S SIX DDE-RELATED COMMANDS

Channel = DDEInitiate(App\$, Topic\$)	Establishes a DDE conversation with the specified server and topic. The channel number that is returned is used in subsequent DDEPoke, DDERequest, DDEExecute, and DDETerminate commands.
DDEExecute Channel, Command\$	Sends a DDE execute message with a command string unique to the receiving application.
DDEPoke Channel, Item\$, Data\$	Sends a DDE message that modifies the value of the specified data item.
Value\$ = DDERequest(Channel, Item\$)	Sends a DDE message that obtains the value of the specified data item.
DDETerminate Channel	Terminates the specified DDE conversation.
DDETerminateAll	Similar to DDETerminate but closes all currently active DDE conversations.

Figure 2: WordBASIC's six DDE-related commands allow you to carry out many of the same DDE operations you could program in C, but with WordBASIC you can get the code working in a fraction of the time.

sults are obtained by taking advantage of WordBASIC's support for dynamic creation of custom dialog boxes.

WordBASIC programs are written and modified with the *Word for Windows* Macro Editor in a special editing window that has buttons for starting, single-stepping, and tracing macros, and a sort of Smalltalk-like "Inspector" window for variables, rather than the more familiar *Word for Windows* ribbon and ruler (see Figure 1). The Macro Editor is just a subset of the *Word for Windows* document editor that doesn't support fonts, fancy formatting, footnotes, and so on; its capabilities are limited to cutting, copying, pasting, searching, replacing, and printing. Each WordBASIC program can be activated in one of four ways: it can be

executed by name from the Macro Run dialog box, it can be added to one of the *Word for Windows* pull-down menus, it can be linked to an accelerator key, or it can be invoked by another macro.

The existence of WordBASIC, together with *Word for Windows*' implementation of a three-level command hierarchy that's vaguely like ToolBook's message hierarchy, turns the program into the ultimate plastic GUI-based editor. When you create a macro, you can designate it as either template or global. When any command is invoked, *Word for Windows* will first search the macros in the template file for the current document, then in the NORMAL.DOT template file (which functions as a repository for all global macros), and finally in its built-in command repertoire. Thus, by simply defining macros with the same names as the predefined commands, you can change *Word for Windows*' behavior completely either on a local (that is, per document) or global basis.

WORDBASIC AND DDE

Whether you have a taste for BASIC or not, one very powerful aspect of WordBASIC is that it is a wonderful test-bed for *Windows*' only true interprocess communication mechanism, Dynamic Data Exchange (DDE). As I discussed in the last issue, there are three essential elements that constitute a DDE conversation between a client and a server: The *application name* is typically the name of the program that functions as the DDE server;

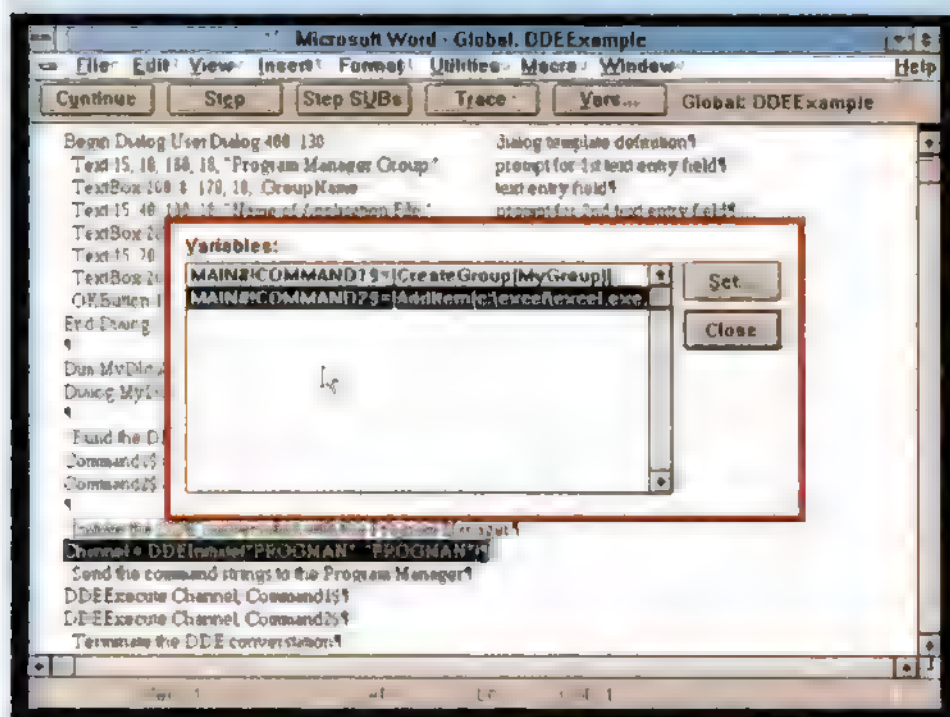


Figure 1: This editing window is used to create and modify *Word for Windows* macros, which are small WordBASIC programs. It replaces the usual *Word for Windows* ruler and ribbon with buttons that let you run, single-step, or trace a WordBASIC program, and also offers a pop-up "Inspector" window for WordBASIC variables.

Power Programming

the *topic* is usually the name of a file that the server knows how to process, and the *item* is either information that specifies the location of data to be inspected or modified or the actual data itself. DDE is based on *Windows*' global data segments, global atoms (strings stored in the *Windows* global memory pool and referenced by handles), and the following nine special *Windows* messages:

- **WM_DDE_INITIATE**, which initiates a conversation between a DDE client and server;
- **WM_DDE_ACK**, used by both clients and servers to acknowledge a received message;
- **WM_DDE_REQUEST**, sent by a client to request a particular data item from a server;
- **WM_DDE_DATA**, used by a server to send a data value to a client;
- **WM_DDE_POKE**, used by a client to send a data value to a server;
- **WM_DDE_ADVISE**, used by a client to request that the server supply an update or notification for a data item whenever the item changes;
- **WM_DDE_UNADVISE**, which terminates a data link that was previously established with the **WM_DDE_ADVISE** message;
- **WM_DDE_EXECUTE**, used by a client to send a free-form ASCII command string to a server; and
- **WM_DDE_TERMINATE**, which terminates a DDE conversation.

These building blocks—memory segments, atoms, and messages—are combined according to DDE protocols to build three types of transactions: (in increasing order of complexity) *cold links*, *hot links*, and *warm links*.

In a cold link, the client first broadcasts an application and topic name with a **DDE_INITIATE** message, and then waits for any server to respond to it. If there is no response, the client can use the *Win-Execute* function to load a potential server and try again. Once it has found a server, the client sends **WM_DDE_REQUEST** messages that specify the data it needs, and the server responds appropriately with **WM_DDE_DATA** messages. The client can also specify the format that it wants the data in. (The client can simply make guesses at this until it stumbles on a format that the server is willing to provide, or

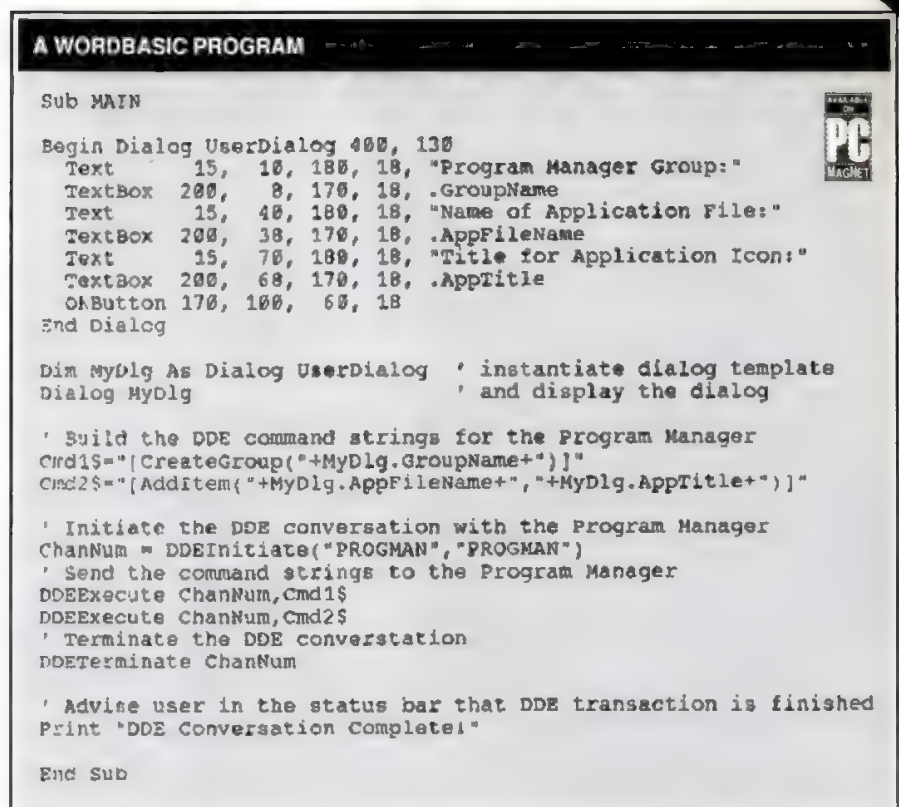


Figure 3: A WordBASIC program or macro that uses DDE to create or activate a group in the *Windows* Program Manager, then add an application filename and title to that group. The necessary information is collected from the user with a custom dialog box.

else it can use a special DDE topic, recognized by most servers, to find out which data formats a particular server supports.) When the client is finished with the server, it sends a **WM_DDE_TERMINATE** message to end the DDE conversation. The server, in turn, acknowledges with another **WM_DDE_TERMINATE** message and then is free to terminate if it has no other business to conduct. As you can see, the server in a cold link is passive and will never cough up any data unless it is prodded to do so.

A hot link puts the server in a much more active role. After the DDE conversation is initiated, the client sends a **WM_DDE_ADVISE** message specifying the data that it is interested in. From that point on, the server is obligated, whenever the data changes, to notify the client with unsolicited **WM_DDE_DATA** messages. When the client no longer wishes to hear about new data values, it sends a **WM_DDE_UNADVISE** message to the server, and the entire conversation is brought to an end with an exchange of **WM_DDE_TERMINATE** messages.

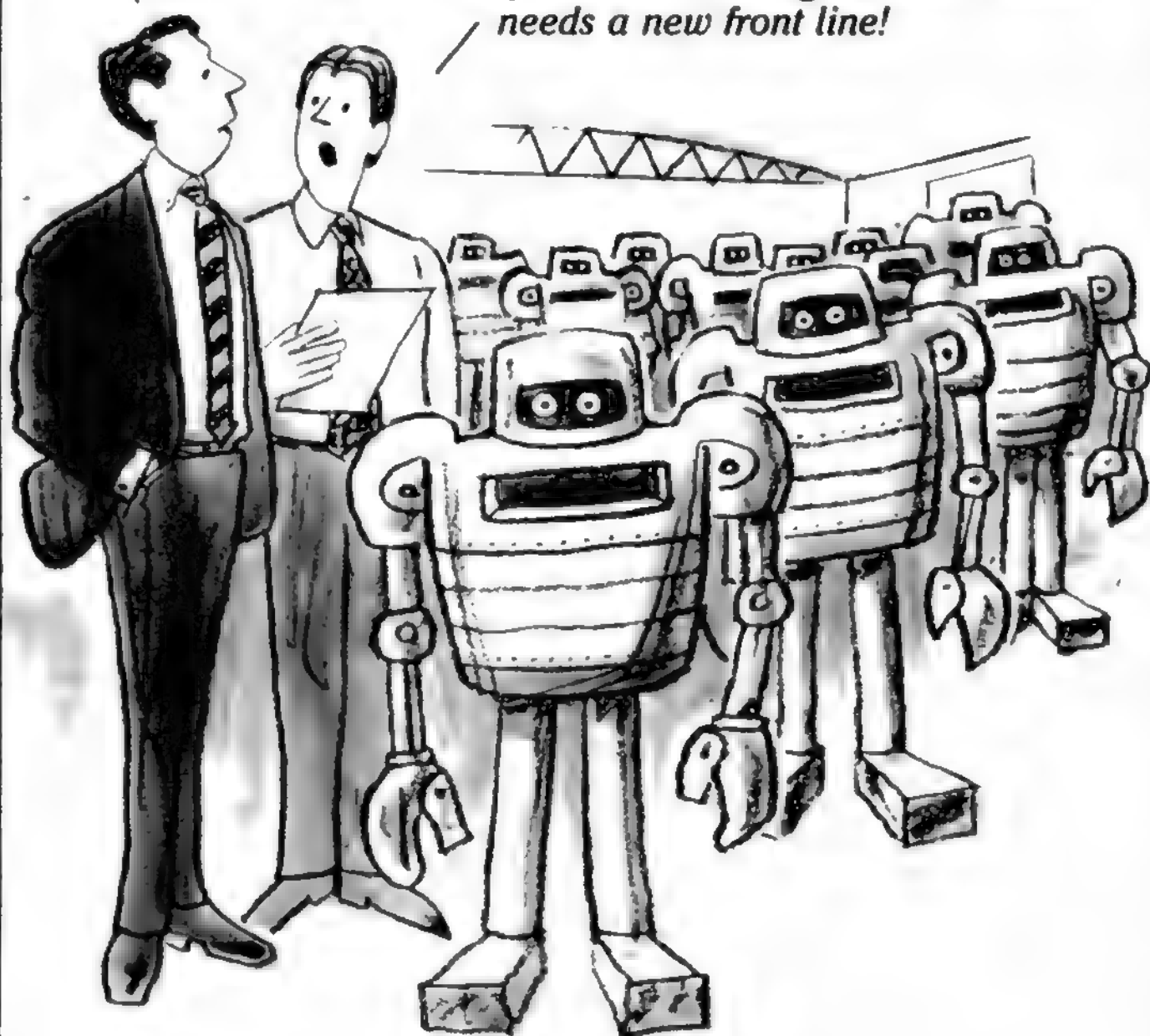
The warm link has features of both cold links and hot links. It's set up in much the same manner as a hot link, but

the server's spontaneous actions are limited to messages announcing that the data has been changed, without actually sending the data itself. When the client actually needs the altered data, it requests the data explicitly with a **WM_DDE_REQUEST** message. The warm link is a trade-off that reduces the load on the system as a whole by requiring more sophistication on the part of the client.

At the C programming level, even the simplest DDE transaction involves a complex exchange of messages and numerous system calls to allocate, lock, unlock, and deallocate global memory segments or atoms, and there are many opportunities for errors or unforeseen conflicts. Furthermore, the DDE protocol is specified at a primitive level, and there are no higher-level standards for the representation of information at all, so the contents of every DDE conversation are completely idiosyncratic to both the client and the server. *Windows* guru Charles Petzold ends the DDE chapter in his book *Programming Windows*, "It is almost impossible to reach a point in DDE coding when you are absolutely certain that you've accounted for all the possibilities of error—particularly when considering that

What are we going to do with your extra robots, Fenton?

Maybe a small college football team needs a new front line!



CALL **EAL** IF YOUR CORPORATION HAS MATERIAL AVAILABLE FOR DONATION.

- EAL** - Will take your donated material and use it to generate scholarships for needy, deserving students.
- EAL** - Donations could mean an above cost tax deduction - IRS Reg.170(e)(3).
- EAL** - Scholarships are given in the donating corporation's name.
- EAL** - Leverages your gift to help participating colleges.



EAL

Educational Assistance Ltd.

P.O. BOX 3021 • GLEN ELLYN, ILLINOIS 60138

For More Details
Call 708-690-0010
Peter Roskam
Executive Director

Power Programming

the program your program is communicating with may have errant behavior. The only advice I can offer you here is simply to do the best you can."

Fortunately, WordBASIC hides nearly all the gory details of DDE programming:

Fortunately,
WordBASIC hides
nearly all the gory
details of DDE
programming.

its six DDE-related commands, shown in Figure 2, allow you to carry out many of the same DDE operations that you could program in C, but you can get the code working in a fraction of the time. In the last issue, I showed you a simple Tool-Book script that used DDE to create or activate a *Windows* Program Manager group, then added an application program filename and title to that group. Figure 3 contains an equivalent program written in WordBASIC. You can use this program as a starting point for your own DDE experiments.

FURTHER READING

The printed manuals supplied in the retail *Word for Windows* package don't include any useful information about WordBASIC. A text file named TECHREF.DOC on the distribution disk does contain abridged programming information, but if you plan to do any serious WordBASIC coding, you'll need to order the following from Microsoft: *Microsoft Word for Windows and OS/2 Technical Reference*. Microsoft Press, Redmond, Washington, 1990. ISBN 1-55615-290-6. 458 pages. \$22.95.

THE IN-BOX

Please send your questions, comments, and suggestions to me at any of the following e-mail addresses:

PC MagNet: 72241,52

MCI Mail: rduncan

BIX: rduncan

Bitstream

BITSTREAM DID NOT INVENT THE TYPE CARTRIDGE.

Technical Stuff: Type City fits into the cartridge slots of HP (II, IID, IIP, III, or IIID) laser printers and compatible clones. • The Type City cartridge base has on board an entirely new collection of text and headline fonts and symbols for business-to-business communications. Each of the four slots holds one low cost Bitstream add-on card with special type, symbols, or graphics. • What would you like on a card? Logos, special symbols, or any customized selection of Bitstream typefaces can be added to the cartridge system and made accessible at all laser printers. • No extra memory required in your printer, no matter how many fonts you add. • Forget about downloading fonts. Free up a couple of megabytes of hard disk space. Get your documents faster, especially when you're sharing a networked printer. • Windows users: Type City comes bundled with a selection of WYSIWYG (what you see is what you get) screen fonts. No additional software is needed. • Also free with each package: The Innocent's Guide to Type, a stand-up guide loaded with hot tips, shortcuts, and tricks of the trade. Plus examples of tightly executed documents that are yours for the taking. Comes with step-by-step, how-to notes for creating them in Aldus PageMaker®, Word, and WordPerfect®.

ANY MORE THAN HENRY FORD INVENTED THE AUTOMOBILE. WHAT BITSTREAM HAS DONE IS RETHINK THE TYPE CARTRIDGE. HOW IT WORKS. WHAT IT LOOKS LIKE. WHAT IT CAN DO. WHAT KIND OF FUTURE IT HAS. UNTIL NOW A HEWLETT-PACKARD LASERJET™ TYPE CARTRIDGE HAS BEEN A HIGH COST, CLOSED END SYSTEM. A COST YOU NEEDED TO PICK UP OVER AND OVER WHENEVER YOU NEEDED A NEW TYPEFACE. WITH TYPE CITY™, YOU INVEST IN ONE EXPANDABLE SUPERCARTRIDGE FOR LASERJET IIS AND IIIS. IT COMES WITH A BRAND NEW COLLECTION OF BITSTREAM® TEXT AND HEADLINE FACES (MICROSOFT® WINDOWS™ SCREEN FONTS INCLUDED). THEN YOU BUILD FROM THERE. WITH LOW COST TYPE CITY ADD-ON CARDS THAT FIT IN THE FOUR SLOTS ON THE SIDES OF THE CARTRIDGE. TO START YOU OFF YOUR FIRST ADD-ON CARD IS FREE IN THE BOX. CUSTOM CARDS WITH YOUR CORPORATE LOGO AND FACES MAY BE ORDERED, TOO. TYPE CITY PUTS A NEW WORLD OF TYPE AT YOUR FINGERTIPS. FOR MORE INFORMATION CALL 1-800-522-FONT, EXT. 1402. FOR A TAXI DRIVER'S TOUR. FOR THE REAL THING, VISIT YOUR TYPE CITY LOCAL DEALER TODAY.



CIRCLE 131 ON READER SERVICE CARD

Circle 131 on Reader Service Card

Announcing Less Paperwork.

(Before)

(After)

Introducing The Billing System You Helped Design.

Before developing our new billing system, we talked to our customers.

We listened to everyone who comes in contact with an invoice—Accounts Payable, Human Resources, Purchasing and the using and processing departments.

During the last two years, we combined your input with state-of-the-art technology in optical imaging, laser printing, EDI and EFT to create a new billing system that delivers the features you want most:

- Less paper plus faster checking and matching capability by printing copies of each time card right on the invoice.

- Easy-to-read, high-quality laser printing.
- Easy-to-handle, standard-size bond paper and no staples.

And we've included options that can save you additional time and money:

- Customized reporting to provide data on usage.
- For those who don't want any paper at all, we offer EDI (Electronic Data Interchange) for billing and EFT (Electronic Funds Transfer) for remittance.

The new Kelly® optical imaging laser billing system. Another industry first—only from Kelly.

KELLY Temporary
Services

The Kelly Girl® People—The First and The Best®
CIRCLE 114 ON READER SERVICE CARD

©1991 Kelly Services, Inc.

by
William S. Hall

Windows

IMAGE MANAGEMENT

I do a lot of work with picture and text files stored in various formats, such as TIFF, .RTF, .PCX, and SYLK, created by an array of *Windows* products, including *Winword*, *Paintbrush*, *Micrografx Designer*, *PageMaker*, and so on. I don't always remember the contents of a given file and frequently end up running through the whole collection looking at every one. Right now I view them by opening each into its respective application—a very time-consuming process. How can I browse through the assortment more conveniently?

Katherine Lee
Mountain View, California



There's a *Windows* program called *Scrapbook Plus* that may help you. It's from a small company in your neighborhood, Eicon Systems, 989 East Hillsdale Blvd., #260, Foster City, CA 94404. *Scrapbook Plus* provides a visual archive for documents and images saved under a wide variety of formats including those you mentioned. The package lets you store and retrieve pictures or text and easily examine either.

Currently, *Scrapbook Plus* does not support *Windows* icon files. Call Eicon at 415-349-4664 if you'd like more information about this product.

SIZING UP WINDOWS

Can I force every *Windows* program to start full-screen? How do programs decide what size to make windows when they open?

Thomas Wolfe
Ann Arbor, Michigan



Unfortunately, windows can't be opened to a particular size under user control. You can, in most cases, make a package minimize upon starting by holding down a Shift key when you double-click on its icon in the Program Manager or on its filename in the File Manager—but that's about the extent of your influence.

- **IMAGE MANAGEMENT:** Keeping track of your graphics files can be rough. Here's a package to help smooth the way.
- **SIZING UP WINDOWS:** How applications get their initial window dimensions and locations.
- **GROUP LIMITS IN REAL MODE:** Why it happens and how to get around it.
- **UPGRADE ENIGMA:** Using the Intel InBoard 386/PC with *Windows* 3.0.
- **LESS IS MORE:** The EGA's shorter fonts can put more lines on VGA displays.

A programming function called *CreateWindow* constructs windows and another, *ShowWindow*, displays them. Four of the parameters *CreateWindow* receives determine initial dimensions when the window displays normally. These values specify the window's left corner horizontally and vertically as well as giving width and height, all in pixels. The programmer may supply them or have *Windows* provide defaults.

ShowWindow receives a parameter named *nCmdShow* that determines whether the window appears, in some variation, as an icon, maximized, or normal. The programmer either directly supplies this value or can accept the *Windows* default. When an application is loaded and the main window is displayed for the first time, however, the programmer should use *Windows*' default. Users observe a result of *Windows*' providing

the parameter when they launch programs while pressing a Shift key. *Windows* sets *nCmdShow* to 7, causing *ShowWindow* to minimize the application.

Windows puts the significant portion of control over initial display in the programmer's hands. Unless that person builds similar abilities into the user interface, your options remain limited.

GROUP LIMITS IN REAL MODE

Windows seems to allow only about eight to ten program groups in its real mode. I've never found any documentation concerning this quirk, but I assume that it has something to do with the 640K conventional memory limit.

Cutting down on groups solves the problem for real mode, but at the same time, it unnecessarily imposes the same limit on the other modes your machine can run. To get around this, I keep a second, special *PROGMAN.INI* and simply use a batch file to select it before starting *Windows* in real mode.

Alan Zisman
Vancouver, British Columbia
Canada



From the information currently available concerning this *PROGMAN.EXE* bug, I'd guess the problem you've encountered stems from a shortage of memory, but not quite in the way you might think. *Windows* reserves a small amount of storage for tracking resources such as bitmaps, cursors, and dialog boxes. Generally, the area expands as needed, but some circumstances in real mode can prevent it from growing, leading to erratic behavior, although you still have plenty of conventional memory available. Numerous events—opening a particular file or launching programs in a certain order, for example—provide the trigger, making prevention difficult. If you prefer not to reduce the groups you keep accessible, there's a workaround that may help.

Windows starts tracking their resources

Windows

when groups first open—but not before. Keeping them minimized until needed will at least buy you more time in a session. To do so, iconize *all* your groups before exiting standard or enhanced mode, making sure to select Save Changes so that they'll come up this way when *Windows* starts. The next time you enter real mode, open groups only as needed. Although you'll no longer be able to see the contents of the other program collections, naming them appropriately makes this a minor drawback.

By the way, *PROGMAN.INI*—an undocumented *Windows* file—holds information for the Program Manager concerning groups.

UPGRADE ENIGMA

I have an original IBM XT upgraded with Intel's InBoard 386/PC and 1MB of RAM. I expected *Windows* 3.0 to run in standard mode, given this combination of processor and memory, but it only comes up in real mode. Furthermore, when I attempt to boot with HIMEM and SMARTDrive, I get an error message claiming no extended memory exists! What's going on?

Jinho Kim

New York, New York



Off-the-shelf Microsoft *Windows* 3.0 on a PC or XT with an InBoard 386/PC works only in real mode, for the most part. Microsoft geared its popular environment to the AT architecture, which contains support chips and code not found in the XT. *Windows* requires many of these extra capabilities to function in standard or enhanced mode. Failing to find them directly, it makes no effort to search for your upgrade hardware.

Don't despair, though—you're not stuck with a 386 boat anchor. Intel developed a full-function adaptation of *Windows* 3.0 for just this case. The package lists for \$99 and can be purchased from PC Connection (6 Mill Street, Marlow, NH 03456; 800-243-8088). InBoard PC owners who have already bought *Windows* should contact Intel at 800-356-3071 for a free upgrade.

Several factors conspire to create your second problem. The BIOS services for extended memory and protected-mode operation don't exist in an XT. Your

InBoard's driver, *INBRDPC.SYS*, hooks interrupt 15h in order to emulate these services. The *Windows* installation routine modifies *CONFIG.SYS*, however, inserting *HIMEM*, which requires extended

Combine the smaller pixel-per-line requirement of EGA fonts with the extra rows the VGA displays, and you get more text in windows and dialog boxes.

memory, *before* *INBRDPC*, which provides it. *SMARTDrive* will suffer the same fate. Naturally, Intel's version of *Windows* performs the setup properly.

You'll also need a memory manager such as *QEMM-386* from Quarterdeck Office Systems or Qualitas's *386MAX* if you want to load TSRs or drivers high. Intel provides a coupon with its *Windows* package allowing you to buy the Qualitas product for \$49.

LESS IS MORE

Here's a *Windows* tip I use to show more information on the VGA screen than normally is possible: replace VGA fonts with those for the EGA. *Windows* provides, on its installation disks, EGA fonts and a utility called *EXPAND* to access them. Invoke *EXPAND* from the DOS command line as follows:

```
expand A:\EGA*.FON  
C:\WINDOWS\SYSTEM
```

(assuming you installed *Windows* in the default directory).

You'll also need to modify the *SYSTEM.INI* file. Using any text editor, change these lines:

```
fixedfon.fon=vgafix.fon  
oemfonts.fon=vgaocem.fon  
fonts.fon=vgasys.fon
```

so they read like this:

```
fixedfon.fon=egafix.fon  
oemfonts.fon=egaoem.fon  
fonts.fon=egasys.fon
```

Revisions to the system-initialization file take effect only when *Windows* first loads, so be sure to start a *new* session.

The system font will be smaller now, which means applications using it will display more lines. *Notepad*, for example, will show 42 lines when maximized—a gain of 14. The menu bar will be thinner and *Word for Windows*' ruler and ribbon will take less space to display themselves.

Myron O. Jordahl

Austin, Texas



The extra display lines Mr. Jordahl's procedure creates come from differences in both resolution between EGAs and VGAs and the sizes of fonts supplied for each adapter type. The VGA packs in 480 lines of vertical resolution against the EGA's 350. The VGA system font measures a robust 16 pixels high and its fixed font 15, while corresponding EGA fonts rise a mere 10. EGA and VGA font widths match—8 pixels apiece, meaning you'll see the same number of characters per line for both. Combine the smaller pixel-per-line requirement of EGA fonts with the extra rows the VGA displays, however, and *shazzam*: more text in windows and dialog boxes that use the system font.

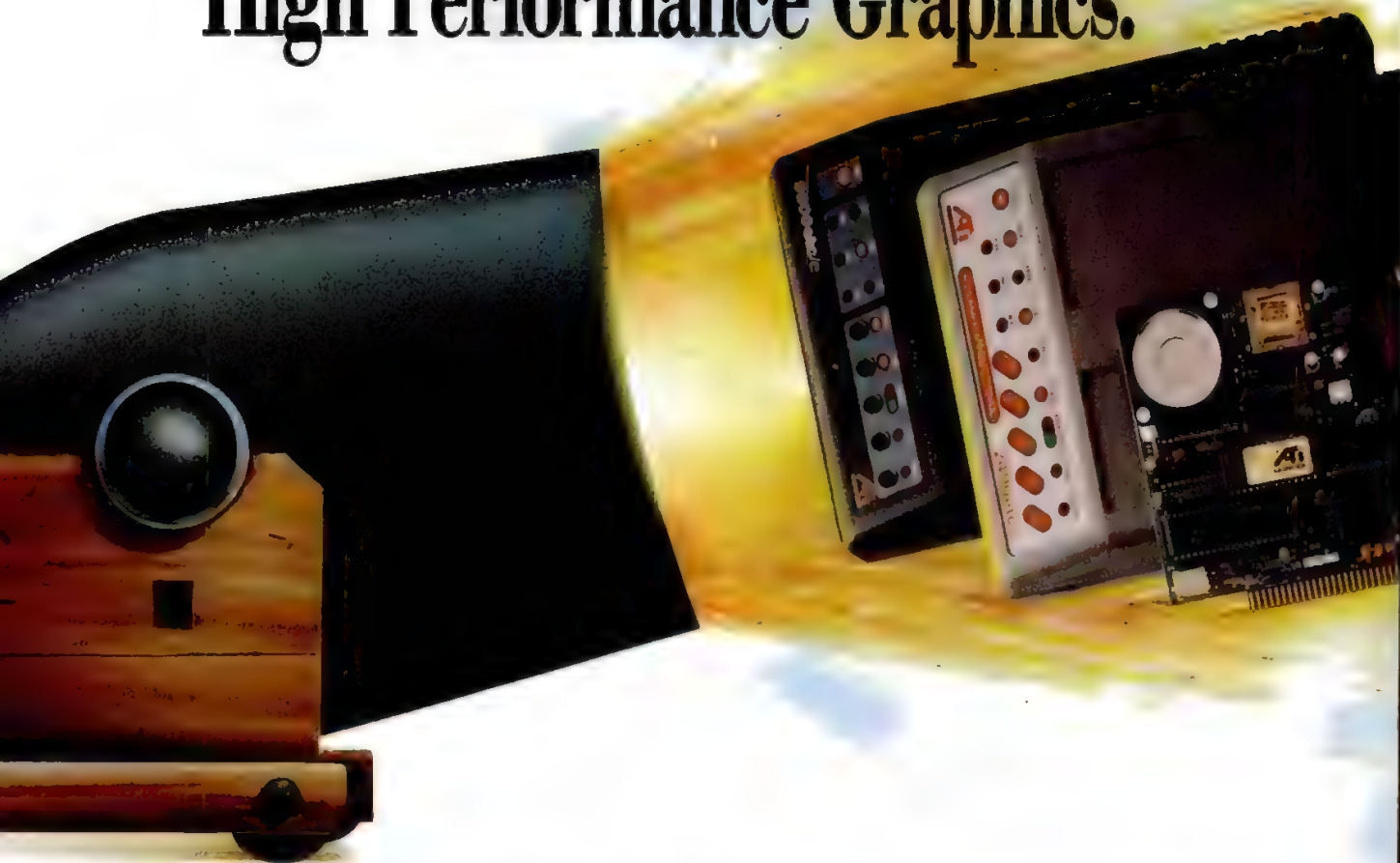
Not everything benefits from our font magic. You'll notice, for example, that dialog box proportions may seem less pleasing. Some boxes size themselves according to the width and height of the system font, so they'll appear fine horizontally but too short vertically.

Some applications—like *Cardfile*—will show no gain at all. *Cardfile* computes the dimensions of a card based on the fixed font's size, so whether you use an EGA, VGA, or 8514, a card contains exactly 11 lines of 40 columns each.

OPENING WINDOWS

Share your experiences with the *Windows* environment. We'll pay \$50 for any tip we print. Mail your contribution on-disk, with a printout, to *Windows*, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see the PC MagNet News page, immediately following the Utilities column, for access instructions).

From the "Big Guns" in High Performance Graphics.



High caliber V.42bis modems with the biggest bang for the fewest bucks.

Why pay a premium price for V.42bis modems from the big shots? Or take a shot in the dark on a no-name? The ATI* family of modems offers the double-barreled advantages of sophisticated error correction and data compression for hundreds less than the competition.

Lowering the price of high performance.

Developing innovative custom electronics has made us a world leader in video graphics technology. Today, ATI is applying that expertise to design and manufacture high performance modems offering all the latest advancements and capabilities for less money.

9600 velocity from a 2400 modem.

Our 2400etc/e* external and internal modems are the lowest priced V.42bis modems on the market. Yet they're loaded with fire power. Like high velocity V.42bis and MNP5* data compression for transmission speeds up to 9600 bps.

Advanced V.42 and MNP error correction for 100% error-free data transfer.

Complete compatibility with the Hayes* AT command set. Plus, the 2400etc/e external offers synchronous capabilities, along with the convenience of easy-set front panel controls. All for under \$300**

Our biggest bang.

For an even bigger blast of speed and performance, take aim at our 9600etc/e*. It combines the industry standard V.32 protocol with V.42bis data compression to simultaneously transmit and receive data up to 16 times faster than 2400 bps modems. Think of how much that can save on transmission costs. Plus our easy-set front panel controls make changing settings a snap. And the 9600etc/e is priced under \$700 **...what some others charge for their 2400 bps modem.

For more information contact your supplier, or:

ATI Technologies Inc.
3761 Victoria Park Avenue
Scarborough, Ontario
Canada M1W 3S2
Tel: (416) 756-0718
Fax: (416) 756-0720

CIRCLE 337 ON READER SERVICE CARD

ATI's Family of Products includes: 8514/ULTRA • VGA WUNDER • • VGA EDGE-16 • VGA BASIC-16

Copyright © 1990 ATI Technologies Inc. *Trademarks are registered by their respective companies. **Suggested retail prices. Dealer may sell for less.


TECHNOLOGIES INC.
Technology you can Trust.

PC Magazine just confirmed what Microsoft and DataEase already know.

The qualities which led *PC Magazine* to name DataEase SQL *Best of 1990* also prompted Microsoft to name us a key SQL Business Partner.

No wonder—combining DataEase SQL with Microsoft's SQL Server, creates a virtually limitless client-server computing environment.

DATAEASE: A PROVEN WINNER.

DataEase 4.2, which our SQL front-end product is based on, has long been the corporate solution for "industrial strength" database applications development.

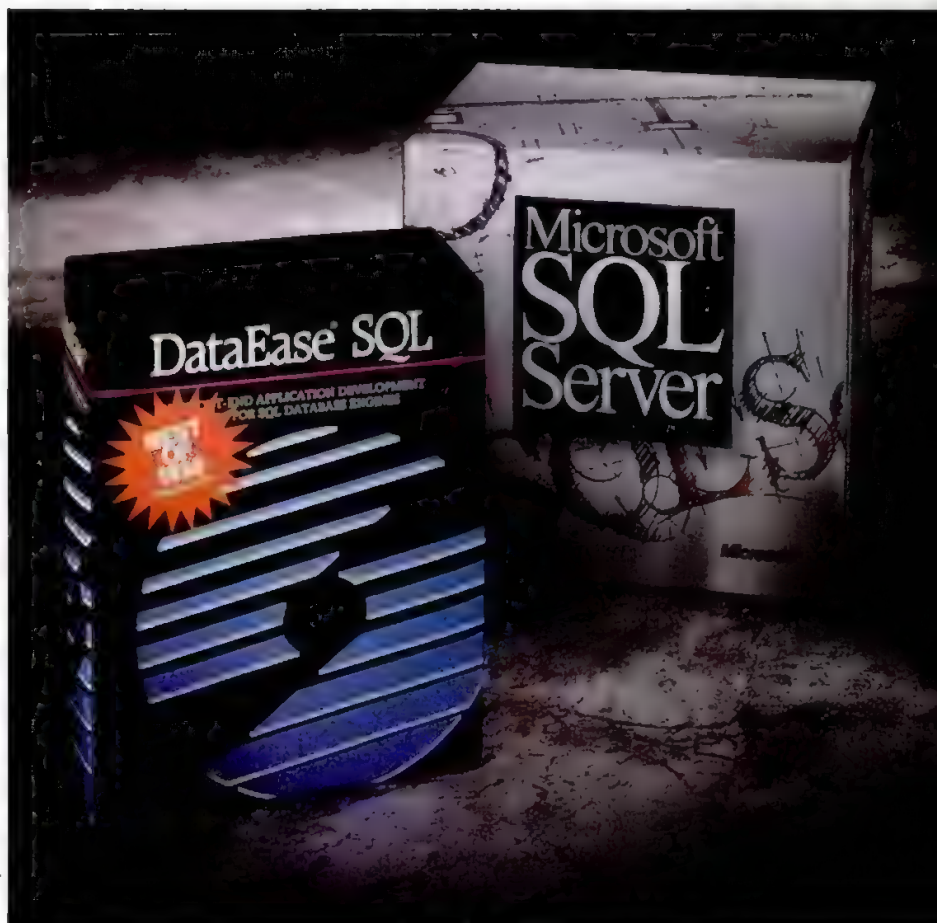
Not only did it place first at the *PC Week Database Shoot-Out*, but we converted the standalone application into a fully-functional client-server system in only 19 minutes. It also won *PC Magazine Editor's Choice* in '86, '88, '89, and *Best of 1988*.

TWO STAR PERFORMERS ON ONE TEAM.

Now that many corporations are making a strategic investment in client-server computing, it only makes sense to invest in the winning team: DataEase and Microsoft.

Only Microsoft SQL Server makes optimum use of client-server architecture with something called Server Intelligence. It lets you centrally manage critical corporate data for your entire PC network with ease.

And only DataEase SQL takes full advantage of Microsoft's technology by giving you



transparent access to all its server capabilities, like triggers and stored procedures, distributed updates, and multi-threaded server access. Plus, DataEase SQL supports both DOS and OS/2 workstations.

When you team the award-winning features of DataEase with the performance, security and integrity of Microsoft SQL Server, you have one powerful business computing solution.

AN OFFER YOU CAN'T REFUSE.

And now for a limited time, you can buy both DataEase SQL and Microsoft SQL Server for

only \$995 (regularly, \$1990). Or DataEase SQL alone is only \$595 (regularly, \$995)*.

To take advantage of either of these limited time offers, or for the name of an authorized dealer, call DataEase Inside Sales at 1-800-334-EASE (in CT, 374-8000).

For more information on Microsoft SQL Server, call Microsoft Inside Sales at 1-800-227-6444 and mention Account P60.



It's time you know more about us.

*Microsoft SQL Server 1.5 User Version. Promotional pricing subject to change without prior notice. DataEase is a registered trademark of DataEase International, Inc. Microsoft and the Microsoft logo are registered trademarks of Microsoft Corporation. © 1991 DataEase International, Inc. All rights reserved.A Microsoft SQL Business Partner

by
Sal Ricciardi

Databases

.BIN FILES IN TURBO C

For quite some time, I've been writing .BIN files to extend the interpreted *dBASE* environment. Recently, I came across an extremely simple technique for writing .BINs in Turbo C.

Most compiled C routines depend on a start-up module supplied by the compiler vendor. This module sets up the C environment, examines the command line and prepares the command line arguments, sets up system global variables, and generally prepares things prior to passing execution to your C program.

Some programs, such as *dBASE*.BIN files, don't need all of this overhead. Moreover, the interface requirements for .BIN files make the use of the standard C start-up modules impossible.

After I had rewritten the start-up code for Turbo C in assembly language different ways, Len Zerman (now with Nantucket) showed me how to use Turbo C's pseudo-register variables to set up a tiny-model C .BIN routine without any assembly start-up code.

This encouraged me to experiment. I found that by using Turbo's compact memory model you can easily link-in many of the Turbo C runtime library routines. Since the compact model library code makes no assumptions about the relationship of the SS and DS registers, a .BIN routine can use the *dBASE* interpreter's large stack space freely, which keeps the size of the .BIN routine to a minimum. (Tiny-model .BINs have to maintain their own stack within the .BIN routine.)

Figure 1 shows a sample .BIN routine written in Turbo C that takes only one parameter, a character string, and reverses it using the Turbo C library routine *strrev()*. Since *STRREV.BIN* uses the *dBASE III Plus* parameter-passing convention (the DS:BX register pair point to the passed parameter), it can be used from *dBASE III Plus*, *dBASE IV*, *FoxBASE Plus*, *FoxPro*, *Quicksilver*, *dBXL*, and any other *dBASE*-like environment that supports the *dBASE III Plus* conventions for .BIN rou-

■ **.BIN FILES IN TURBO C:**
How to write a *dBASE*.BIN file using Turbo C.

■ **BATCH FILES IN CLIPPER:** Here's a way to generate batch files using *Clipper's* low-level I/O commands.

tines. Since the compact model defaults to far data addresses, all that's necessary to reference the *dBASE* string is to declare a far pointer and load it with the macro *MK_FP()*. The pointer can then be passed to the *strrev()* library routine.

There are limits to this approach: no memory can be allocated at runtime except on the *dBASE* stack, and any library routines that reference globals declared in the Turbo start-up code have to be dealt with as

special cases. But I find Turbo C's library routines for string manipulation to be free of these constraints, and I no longer have to reinvent the wheel every time I need to juggle some characters around. The size and speed of the resultant .BINs competes with anything I have written in assembly language. (*STRREV.BIN* is only 86 bytes!)

Maybe the biggest limitation of this approach is that if you need to reference static data, you have to get Turbo C to group the data and code segments together as they are in a tiny model. Otherwise, references to data in Turbo C's *_DATA* segment will not work within the .BIN module.

A little experimentation showed that combining the data and code segments in a compact-model .BIN is as simple as inserting these two lines at the top of the C code:

```
asm DGROUP GROUP _DATA, _BSS, _TEXT
asm ASSUME CS:DGROUP, DS:DGROUP
```

The C compiler warns you that these com-

STRREV.C

COMPLETE LISTING

```
/* STRREV.C
   STRREV.BIN source, compile/link with:
   TCC -mc -c strrev           : memory model MUST BE compact,
   TLINK /i strrev,,,D:\TC\LIB\CC : data is far, use dBASE's stack
                                   : assuming CC.LIB is in D:\TC\LIB\
                                   : creates STRREV.BIN

   EXE2BIN strrev
   DEL strrev.obj
   DEL strrev.exe

   to use from dBASE:
   .LOAD strrev
   .m="whatever"
   .CALL strrev WITH m
   * m will be reversed
*/

#include <dos.h>                      /* for MK_FP() */
#include <string.h>
void far main(void)
{
    char *param;                      /* compact model forces "far" */

    if (_DS == 0)                     /* if no parameters passed */
        return;                      /* return */

    param = MK_FP(_DS, _BX);          /* address the passed parameter */

    strrev(param);                    /* call library routine */
    return;
}
```

Figure 1: The *STRREV.C* source code for *STRREV.BIN*, a *dBASE* callable .BIN routine that reverses the contents of a string.

Databases

mands make no sense to it, but it passes them on to TASM (Turbo Assembler), which is all we need. What we have essentially done is to create a mixed-model .BIN routine. This enables us to use the Turbo C's compact-model library and *dBASE*'s copious stack space, without losing the advantages of tiny-model .BIN architecture.

With *dBASE IV*, .BINs become much more powerful. You can pass up to seven parameters to a .BIN. They can be used in index expressions, calculated-field expressions, and even reports and queries.

The listing in Figure 2, for RAT.BIN, uses the *dBASE IV* extensions to the .BIN interface to provide a function like *dBASE*'s AT(), only it finds the last occurrence of a substring within a string instead of the first.

R. Russell Freeland
Ft. Lauderdale, Florida



Creating routines to extend the *dBASE* environment with functions that aren't already built-in often involves the creation of .BIN routines. These routines serve to supplement *dBASE* with added functionality. In fact, several commercial add-in libraries that extend the *dBASE* environment are actually .BIN files, accessed through the *dBASE* LOAD and CALL interface.

Traditionally .BIN files are written in assembly language, for several reasons. First, there's the need to keep them small and fast. With assembly language, you can control precisely the size of your .BIN files. Such control is not so easily accomplished with most high-level languages.

Second, the LOAD and CALL interface for .BIN files has specific interface requirements that used to be difficult to adhere to in high-level languages.

The technique presented by Mr. Freeland is a compromise: it gives you the opportunity to program .BIN files in C although not without the limitations mentioned above. Since it may be difficult to discover which Turbo C library routines are compatible with this approach, the name of the game is to test carefully!

The RAT function in Figure 2 uses the *dBASE IV* interface extensions, so it works only with *dBASE IV*. *Clipper* and *FoxPro* already have built-in RAT functions.

Both RAT.BIN and STRREV.BIN are available on PC MagNet.

BATCH FILES IN CLIPPER

Here is a nondatabase example of *Clipper* usage. I needed a routine that would generate a backup procedure using the system date from within a menu program.

The *Clipper* program in Figure 3 reads the system date and writes its own batch file. I put the program in a batch file, followed by a command to execute the backup procedure that it creates (BAKKUP.BAT). The last line of the batch file transfers execution back to the menu program.

Reg Beck
Williams Lake, British Columbia
Canada



This illustrates how easy it is to generate batch files using *Clipper*'s low-level file I/O commands. *FoxPro* also includes a suite of low-level I/O commands.

If you're using a *dBASE* implementation that does not include low-level I/O support, you can generate ASCII files, such as batch files, using SET ALTER-

RAT.C

COMPLETE LISTING

```
/* RAT.C
RAT.BIN source, compile/link with:
TCC -mc -c rat          : memory model MUST BE compact,
TLINK /i rat,;D:\TC\LIB\CC : data is far, use dBASE's stack
                           : assuming CC.LIB is in D:\TC\LIB\
                           : creates RAT.BIN

EXE2BIN rat
DEL rat.obj
DEL rat.exe

to use from dBASE IV only(!):
.LOAD rat
.srchstr="the quick sly fox jumped over the..."
.position=CALL("rat",0,srchstr,"the")
* now position = 31
* All parameters can be fields, expressions, memvars, or literals.
* The numeric parameter MUST be numeric and the last two MUST be
* strings.
*/

#include <dos.h>
#include <string.h>
#include <stdlib.h>

short rat(char *s, char *f);

void far main(void)
{
    char **argv;
    short retval;

    if (_CX != 3)          /* If there aren't three */
        return;          /* parameters, return */

    argv = (char**) MK_FP(_ES, _DI); /* point to dBASE parameter */
                                   /* table in ES:DI */
    retval = rat(argv[1], argv[2]);

    itoa(retval, argv[0], 10); /* convert number to a string */
    return;                  /* back to dBASE */
}

short rat(char *srchstr, char *findstr)
{
    char *mark;
    char *astring = srchstr;

    if (*srchstr == 0 || *findstr == 0) /* If one of them isn't set */
        return(0);                  /* return 0 */

    mark = strstr(astring, findstr); /* Call library function */

    if (mark == NULL)               /* If not found, return */
        return(0);

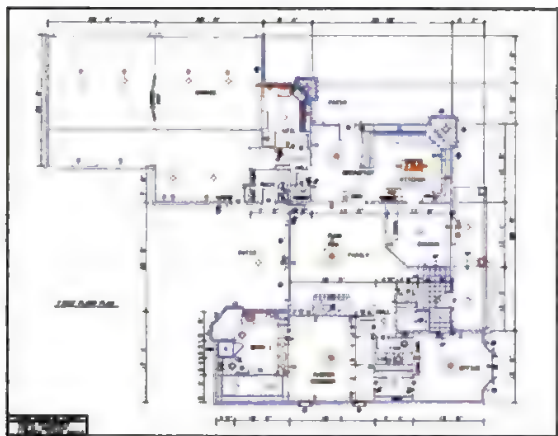
    astring++;                     /* Bump past that position */

    while (mark != NULL)           /* While we keep finding them */
    {
        astring = mark;
        mark = strstr(astring + 1, findstr); /* Keep finding them */
    }

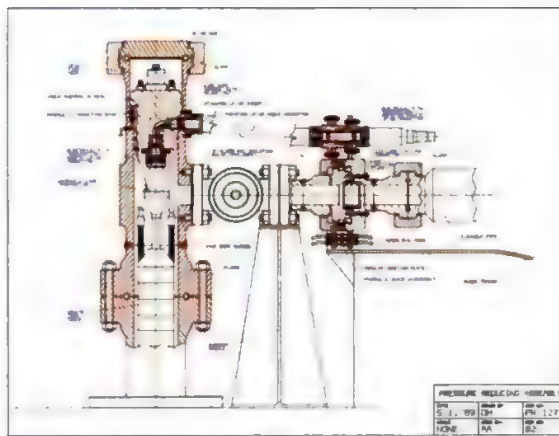
    /* Return position of last one */
    return(astring - (srchstr + 1));
}
```

Figure 2: The RAT.C source code for RAT.BIN, a *dBASE IV*-callable routine that returns the position of the last occurrence of a substring within another string.

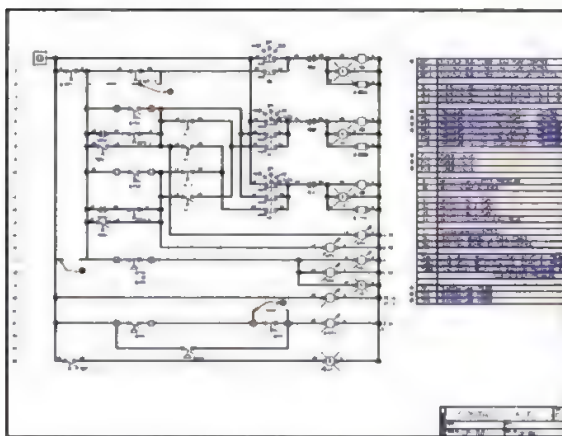
WHAT MAKES A BEST SELLER A BEST SELLER?



A great plot begins with a great idea, easily translated through every phase of design with Generic CADD 5.0.



Deadline pressure is a thing of the past. Designs can be quickly edited and annotated to produce final working drawings.



No matter the complexity, symbols keep your work flowing uninterrupted. Tap our professional libraries or create your own symbols.



Need to fit a conventional design in a nonconventional space? Revise and improve in less time with Generic CADD's one-stop convenience.

A GREAT PLOT.

Ask any of over 250,000 users of Generic CADD.™ They've discovered CADD that's powerful without being complicated. And professional without being pricey.

Our latest version, Generic CADD 5.0, is just \$495. It's a complete design and drafting program backed by a support team that's drawing rave reviews.

Call us at 1-800-228-3601 for our free full-color CADDalog® and portfolio of CADD drawings.

You'll see every plot has a great ending.



Generic
SOFTWARE
An Autodesk Company

**IT DOESN'T GET
ANY EASIER.**





Uncle Sam Says

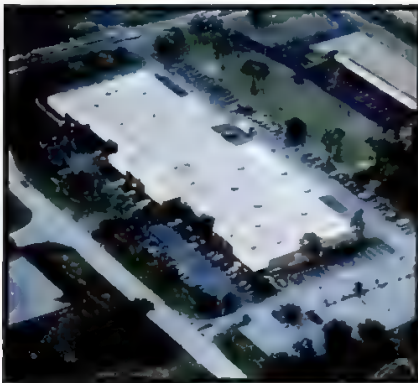
WE BUY SAFETY, EXPERIENCED SUPPORT AND SOUNDNESS.

You too can enjoy the same proven safety. Over the past ten years more than 700 of my agencies and their contractors bought computers from Iverson, because of their experienced support and soundness.

Committed!

Iverson is committed to delivering total quality.

Total Quality Control means incoming, in line, test and burn in, cosmetic, packaging, and shipping inspection. Furthermore, individual custom foam packing of each system insures safest shipping.



Supportive!

Iverson offers full integration services.

- Design and Install LANS
- Custom Hardware
- World-wide installation & Training
- Software loaded at plant
- Custom application software and printer drivers

Established!

Iverson has invested in the plant and staff resources to stand behind your IBM® PS/2® purchase.

Iverson operates two huge classified systems integration contracts nationwide, over \$15 million a year for each

Iverson customizes and manufactures computers in the firm's own 48,000-square-foot plant in Clearwater, Florida.

Iverson operates its own full service FCC laboratory at the Florida plant.

Responsive!

Iverson understands the support you need and is committed to providing it.

For only \$99, we will send our technician/trainer to your home or office to provide 90 minutes of instruction for up to four people. This service is available in most cities nationwide.



**Nationwide
Training in
home/office.
Start-up
course,
only \$99.**

Experienced technical support or on-site service is only a phone call away. Iverson support includes 24-hour toll-free technical and service support hotlines. Our 7000-square-foot repair depot supports ten Iverson field service offices and 150 TRW service offices in the U.S. and 100 in Canada with over 4,500 different parts.



IBM and PS/2 are registered trademarks of International Business Machines Corporation

Traded on American Stock Exchange (IVT)
IVERSON TECH



MOST IBM[®] SYSTEMS

- TEMPEST
- Removable Drives
- Ruggedized
- Custom Applications

Over 700 customers world-wide have benefited from ITC's customization of IBM products. From laptops to desktops, micros to mid-range processors, International Technology has an IBM-based solution for your special computing needs. So why risk your critical application on anything less than IBM quality and reliability.

- Specializing in re-engineering of 9370 (9332) DASD to provide removability.

Model 50Z with Removable Hard Disk

Over 500 shipped to date

- Additional customizing and quick delivery.
- Rack mounted PS/2 Model 70s, ruggedized for protection against Vibration, Shock, High and Low Temperatures, Humidity and Dust per MIL-STD-810D, methods 501.2, 502.2, 510.2 and DTB ISL-89-0896.

GSA Contract #: GSOOK90AGS5276

CALL 1-800-388-GSA1

**EXPERIENCED
SUPPORT
FINANCIAL
STRENGTH**

**SINCE
1978
CURRENT
ASSETS
(9/30/90)
\$17 million**

P.O. Box 6250 • 1356 Beverly Road
McLean, Virginia, 22106-6250

INT'L TECHNOLOGY CORP

A Subsidiary of

IVERSON TECH

CIRCLE 480 ON READER SERVICE CARD

Databases

BKP.PRG
COMPLETE LISTING

```

*
* Name          BKP.PRG
*
CLEAR
CrLf = "CHR(13) + CHR(10)"
DO MainWork
RETURN

PROCEDURE MainWork
    STORE DTC(DATE()) to today
    DO FileWork WITH today
RETURN

PROCEDURE FileWork
    .....
    * Creates a batch file for backing up
    .....
PARAMETERS date
    str1 = "XCOPY C:\SAS\*.* F:\SAS /D:"+date
    str2 = "XCOPY C:\SAS\PRT\*.* F:\SAS\PRT /D:"+date
    str3 = "XCOPY C:\SAS\AL\*.* F:\SAS\AL /D:"+date
    DO WHILE .T.
        buffer = "@echo off"+CrLf+str1+CrLf+str2+CrLf+str3+CrLf+CHR(26)
        fhandle = FCREATE("c:\bakkup.bat",8)

        bytesret = FWRITE(fhandle, buffer)
        result = FCLOSE(fhandle)
        exit
    ENDDO
RETURN
* eof
    
```



Figure 3: This program illustrates the use of *Clipper's* low-level I/O functions to generate a batch file.

NATE TO and the ? command. For example, to create a batch file that will set an environment variable to today's date, you could use the following:

```

SET ALTERNATE TO TODAY.BAT
SET ALTERNATE ON
? "@echo off"
? "SET TODAY="+DTC(DATE())
SET ALTERNATE OFF
    
```

This would create TODAY.BAT, which you could then run to create the TODAY environment variable.

LET US HEAR FROM YOU

Share your database experience, tips, and techniques and we'll pay you \$50 for any tip we print. Submissions can be mailed to our office or uploaded to PC MagNet. Mailed submissions must be made on-disk, accompanied by a printout, and sent to Databases, *PC Magazine*, One Park Avenue, New York, NY 10016. To upload your contribution, see the PC MagNet News Page following the Utilities column for access instructions. You may also contact Sal Ricciardi via his CompuServe ID number: 72241,33.

Now 4 can share HP's LaserJet III printer...

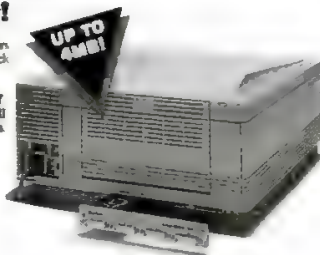


...with BayTech's LaserShare® — expansion is made easy!

LaserShare is an expansion card that allows four users to connect simultaneously to one laser printer. Just check out our outstanding features:

- ✓ **HP LASERJET III AND IIIi COMPATIBILITY**
Also works with HP LaserJet II, IIi, Canon LPB8II, LPB8III, Brother HL8e and Wang LDP8 laser printers.
- ✓ **256KB, 1MB OR 4MB BUFFER**
- ✓ **SIMPLE INSTALLATION**
- ✓ **AVAILABLE MODELS**
 - 4A 4 parallel ports
 - 4C 4 serial ports
 - 4E 2 parallel/2 serial ports
 - 4CB 4 serial (256KB Brother)
- ✓ **SAVES MONEY AND TIME**
- ✓ **UNMATCHED PRODUCT SUPPORT**

With several users having access to one laser printer, the per user cost of your laser printer is dramatically reduced. And there's no more waiting for the printer. With LaserShare, everyone's printing needs are accommodated. BayTech's LaserShare — it's worth checking out! Call now for details!



Because Resources Should Be Shared.

BayTech

Data Communications Products Division
200 N. 2nd St. P.O. Box 387 Bay St. Louis, MO 39520
Fax 601/467-4551 Phone 601/467-8231 or toll-free
800-523-2702

*All products or company names are trademarks of their respective holders.

PROTECT YOUR COPIES OF PC MAGAZINE

Make your collection of *PC Magazine* a handsome addition to your office or home—and protect and organize your copies for easy reference!

PC Magazine Binders and Cases are made of durable, luxury-look leatherette over quality binder board. Custom designed for *PC Magazine*, every order receives FREE transfer foil to mark dates and volume numbers.

FOR FAST SERVICE CALL TOLL-FREE 1-800-825-6690

MAGAZINE BINDERS

Hold your issues on individual snap-on rods. \$9.95 each; 3 for \$27.95; 6 for \$52.95.

OPEN BACK CASES

Store your copies for individual reference. \$7.95 each; 3 for \$21.95; 6 for \$39.95.

PC MAGAZINE

c/o Jesse Jones Industries
499 East Erie Avenue • Philadelphia, PA 19134

Please send ☐ Binders ☐ Cases Quantity _____
Payment enclosed \$_____. * Add \$1 per case/binder for postage & handling. Outside USA, add \$2.50 per case/binder ordered, US currency only.

Charge my: ☐ AmEx ☐ Visa ☐ MC (Minimum order \$15.)

Card No. _____ Exp. Date _____

Mr./Mrs./Ms. _____
please print full name

Address _____
No P.O. Box Number Please

City _____

State _____ Zip _____

*PA residents add 6% sales tax.

HIGHEST QUALITY

BEST PRICE- PERFORMANCE

486/33 MHz EISA w/64K Cache	\$4131
486/25MHz w/8Kcache	\$1949
386/33MHz w/64K cache	\$1199
386/25MHz w/64K cache	\$1082
386/25MHz	\$997
386SX/20MHz	\$920
386SX/16MHz	\$669
286/12 MHz	\$499

Features: 1MB w/0 wait state, 1.2 or 1.4 MB floppy drive, 1 parallel/2 serial ports, 101 Keyboard, Floppy/IDE controller & 200W power supply



MOST EXTENSIVE CUSTOMER SUPPORT IN PC INDUSTRY

- One-year on-site Warranty
- Toll-free technical hot-line
- 30-day money back guarantee
- On-site maintenance by TRW throughout USA and Canada
- Free Installation of DOS if purchased with system
- Other software loaded at our low hourly rate

**Nationwide
Training in
home/office.
Start-up course,
only \$99.**

- 1 hrs operator training in home/office (up to 4 persons) \$99
- Network design and installation
- Two and three year on-site extended warranty
- Driver and Application Software written
- Free Installation video tape

HARD DRIVE OPTIONS

IDE	ESDI w/ controllers
40 MB \$257	150 MB \$1,283
80 MB 422	340 MB 1,770
100 MB 569	650 MB 2,711
120 MB 597	SCSI
179 MB 786	1 GB \$5,580
200 MB 879	Erasable optical cartridge

DISPLAY OPTIONS

(price includes monitor & adapter)

12" Mono TTL, 720 x 350	\$135
14" Mono VGA, 640 x 480	257
14" Color VGA, 640 x 480 .52	384
14" Color VGA, 640 x 480 .41	425
14" Color VGA, 1024 x 768 .28	519
16" Color VGA, 1024 x 768 .31	933
20" Color VGA, 1024x768 .31	1948

LOW COST PRINTERS

4 PPM	Okidata Laser	\$741
8PPM	Postscript Laser	2,254
9 Pin	NX-1001	149
24 Pin	NX-2420	call
Free 6 Foot Parallel Cable Included		
Other Models Available		

GSA SCHEDULE PRICES FOR ACTIVE/RETIRED MILITARY & FEDERAL EMPLOYEES

Federal/Military/Active/Retired employees, with proper ID, are invited to purchase computers at Iverson's GSA prices...the government's own special prices. GSA price offer limited to GSA schedule products. (Contract prices established by subsidiary, International Technology Corp., with GSA Contract Number: GS00K90AGS5276. Some configurations not available on GSA contract.) Call to receive GSA quote or to place an order.

ORDER TODAY

1-800-444-PC90

**EXPERIENCED
SUPPORT**

SINCE
1978

**FINANCIAL
STRENGTH**

CURRENT
ASSETS
(9/30/90)
\$17 million

P.O. Box 6250 • 1356 Beverly Road
McLean, Virginia, 22106-6250

IVERSON COMPUTER CORPORATION

A Subsidiary of

IVERSON TECH

CIRCLE 480 ON READER SERVICE CARD



WHEN A POWER STRIP IS NOT ENOUGH.

Power surges. Power spikes. They can corrupt or destroy your most valuable data.

And while power strips may offer some protection, in most cases it is just not enough.

But now you can have the kind of total protection your data deserves. With Kensington's MasterPiece® Plus.

More than just a power strip, it is an integrated and sophisticated *power center*.



Most power strips are UL rated at 10 amps — MasterPiece Plus is UL rated at 12 amps. This translates into less chance of a circuit breaker opening with a resulting loss of data. (And with some laser printers alone drawing over 10 amps when they first start up, this added protection is critical.)

Most power strips offer little or no phone line

data protection. MasterPiece Plus provides the highest quality EMI and RFI noise filtration combined with modem surge protection.

And MasterPiece Plus offers something no power strip can — fingertip control of each peripheral, plus a master switch that controls the entire system.

It even has a sturdy swivel base (detachable) that lets you adjust your monitor for the perfect viewing angle.

What's more, only the best outlets, materials and circuitry are used.

So when it comes to total power protection and control, don't invest in anything but a MasterPiece.

Choose between MasterPiece, Master Piece Plus and Master-Piece Remote.

For a free brochure and the dealer nearest you, call 800-535-4242. Outside the U.S. 415-572-2700.



MasterPiece Remote

KENSINGTON.

CIRCLE 220 ON READER SERVICE CARD

by
Craig Stinson

Spreadsheets

LISTING END-OF-THE-MONTH DATES

In your January 15, 1991, issue, you published a *Lotus 1-2-3* formula that computes a series of dates separated by exactly one month. The formula doesn't work if the starting date is the 29th or later. For example, if the starting date is January 29, the next date in the sequence would be March 1. I'd like to generate a sequence of dates in which each date is the last day of the month. Can you help me with this?

Francisco D. Fernandez
El Palmar Sur Isla Verde, Puerto Rico

PC Yes. The way to generate a sequence of month-ending dates is to generate month-beginning days and subtract 1 from each. You can use the formula published in our January 15 column to do this (set **STARTDATE** to the first of a month and subtract 1 from the result). Or you can use the following simpler formula, which was submitted by R. Lee Randall:

```
@DATE (@YEAR (STARTDATE+$INTERVAL) ,  
@MONTH (STARTDATE+$INTERVAL) , 1) -1
```

In this formula, **STARTDATE** is a named cell containing the first date in your series. **INTERVAL** is a named cell containing any value from 32 to 60. Because you'll need to replicate this formula down a column or across a row to create a series of dates, the reference to **INTERVAL** must be absolute.

If **STARTDATE** is the last day in a particular month, then, for any value of **INTERVAL** between 32 and 60, **STARTDATE+INTERVAL** will be a date in the second calendar month following **STARTDATE**. For example, suppose that **STARTDATE** is February 28, 1991, and **INTERVAL** is 35, then **STARTDATE+INTERVAL** is April 4, 1991. The **@DATE** function in Mr. Randall's formula would then return April 1, 1991, and the formula as a whole would return March 31, 1991.

■ **LISTING END-OF-THE-MONTH DATES:** A short formula lets you generate this sequence of dates in *1-2-3*, *2.x* and *Quattro Pro*. *Excel* and *1-2-3*, Release 3, provide built-in commands for the same task.

■ **USING TEXT VALUES IN LOOKUP FUNCTIONS:** **@HLOOKUP** and **@VLOOKUP** are not well documented, but here are some tips to avoid errors and miscalculations when using text values as arguments.

You can use this same technique to generate quarter-ending dates. In this case just set **STARTDATE** to the end of some quarter and **INTERVAL** to a value greater than 92.

RELEASE 3 INTERVAL CODES

Interval	code
Second	s
Minute	min
Hour	h
Day	d
Week	w
Month	m
Quarter	q
Year	y

Figure 1: Use this listing of available date and time intervals to select alternate step values for the **STARTDATE** formula.

Mr. Randall's end-date formula works in any version of *1-2-3*, as well as in *Quattro Pro*.

Users of *1-2-3*, Release 3.x, can use the **/Data Fill** command to generate date

sequences—including month-ending or quarter-ending dates. For example, to fill **A2..A13** of a Release 3.0 or 3.1 worksheet with the last days of each month in 1991, you can do the following: Move the cell pointer to **A2** and issue the **/Data Fill** command. When prompted for a start date, type 31-jan-91. When prompted for a step value, type 1m. When prompted for a stop value, type 99999. *1-2-3* responds by filling **A2..A13** with the appropriate date values, which you can then format as dates.

In this procedure, you can type your start date in almost any format that *1-2-3* Release 3.x recognizes as a date. For January 31, 1991, you could type 31-jan-91, 31-jan, or 1/31/91. If you omit the year, *1-2-3* uses the current year. You cannot enter 1/31 as a start date, however, even though that's one of *1-2-3*'s standard date formats (the default Short International format). *1-2-3* interprets 1/31 as a fraction, not a date, and gives you an invalid date error message.

You can use intervals other than the month as your step value. The table in Figure 1 lists the available date and time intervals and their codes. To generate a sequence of times beginning at noon with an interval of 3 hours, for example, you could type 12:00 as your starting value and 3h as your step value.

One caution: *1-2-3* will appear to accept fractional step values, such as 3.5h. But it will disregard (not round) any value to the right of the decimal point, and it won't warn you that it's doing so.

Microsoft Excel users will also find a fill command to generate date series. To fill **A2:A13** of an *Excel* worksheet with 1991's month-ending dates, start by typing 1/31/91 in **A2**. Then select **A2:A13**, choose the **Data** menu's **Series** command, and fill out the dialog box. Note that you don't have to enter a Stop Value. Unlike *1-2-3*, Release 3.x, *Excel* doesn't have a simple procedure for creating time sequences. But, it does know how to create daily sequences that omit weekends. Now,

Spreadsheets

if we could just get it to omit holidays and birthdays.

USING TEXT VALUES IN LOOKUP FUNCTIONS

The @VLOOKUP and @HLOOKUP functions in *Lotus 1-2-3* are (and always have been) poorly documented. Apparently, Lotus is still unaware that some people use them for looking up data from an alphanumeric field. And in the process of supplying text arguments to @VLOOKUP, I discovered a strange anomaly associated with the two functions.

I use a two-column vertical lookup table like the following:

A	B
1 Rotterdam	0
2 Dordrecht	18
3 Spijkenisse	28
4 Barendrecht	8

Column A lists the names of cities and towns, and column B lists the distances in kilometers between those towns and Rotterdam, where my firm is located. This two-column range is named PLACES. I use the information in PLACES to calculate employee travel reimbursements.

In another part of the worksheet—say cell G10—the name of the employee's home town appears. Then I use the following formula to get the distance information from the lookup table:

```
@VLOOKUP (G10, $PLACES, 1)
```

If cell G10 contains Dordrecht, the formula returns 18. If G10 contains Barendrecht, the formula returns 8—and so on. If G10 contains the name of a city—such as Amsterdam—that's not listed in PLACES, the formula returns ERR. That's fine; the ERR value alerts me that I need to include a new name in the table.

The problem arises if cell G10 is blank. In that case, my @VLOOKUP formula returns not ERR, but rather the value associated with the last item in the table! This value is certainly incorrect and causes me to add the wrong amount to my employee's paycheck.

I solved the problem by ending my table with the phony town name ZZZZZ. In the column to the right of this fictitious name, I entered @ERR. Now if cell G10

is blank, the formula gives me an ERR value, as it should.

Martin Pruimers
Spijkenisse, Holland



Mr. Pruimers is justified in complaining about the dearth of information in the *Lotus 1-2-3* manuals. The documentation for 1-2-3, Release 2.2, says nothing about the use of text values in the first argument for an @VLOOKUP or @HLOOKUP function. The Release 3.1 manual acknowledges that text can be used but is silent about the anomaly (translate: bug) described by Mr. Pruimers.

Excel doesn't have a procedure for creating time sequences, but it does know how to create daily sequences that omit weekends.

Matters are even worse for *Quattro Pro* users. The manual for *Quattro Pro*, Version 2.0, provides the following bit of misinformation: "If X [the first argument in the @VLOOKUP formula] is a number and the index column [the first column of the table] contains only labels, *Quattro Pro* returns ERR." It doesn't; it actually returns a value associated with the last entry in the index column.

There are several things you need to remember about using text in the first column of a vertical or top row of a horizontal lookup table. These points apply to 1-2-3, Release 2.x and 3.x, and all versions of *Quattro Pro*.

- The labels can be in any order; they do not have to be sorted.
- The text in the first argument of the lookup function should match one of the table entries exactly—including capitalization.
- If the first argument of the lookup function is a text value that does not match a table entry, the function returns ERR.
- If the first argument of the lookup function is a number, and the index column or row contains only labels, the function

behaves as if the first argument matched the last entry in the index column or row.

- If the first argument of the lookup function is a reference to an empty cell, the function behaves as though the first argument matched the last entry in the index column or row. This is the anomaly reported by Mr. Pruimers.

In short, when the lookup table is indexed by text, referencing a numeric or empty cell as the function's first argument can get you into trouble. Mr. Pruimer's workaround—adding a dummy entry at the end of the table—is satisfactory, if not terribly elegant. Another approach is to add the @S function to the first argument of the lookup function, like this:

```
@VLOOKUP (@S (G10), $PLACES, 1)
```

The @S function returns the value of a cell (or the upper-left corner cell of a range) as a string. If that cell contains a label, @S gives you the label unchanged. If the cell is blank or contains a number, @S returns an empty string (""). Thus, assuming the index column of the lookup table contains no empty strings,

```
@VLOOKUP (@S (G10), $PLACES, 1)
```

returns ERR if G10 is blank or numeric.

You can also stay out of trouble by capitalizing all the labels in your index column and writing the formula this way:

```
@VLOOKUP (@UPPER (G10), $PLACES, 1)
```

I prefer this approach, because it eliminates two hazards at once. First, if G10 is blank, @UPPER(G10) returns ERR. The formula is then equivalent to

```
@VLOOKUP (@ERR, $PLACES, 1)
```

and the result is ERR. Second, it allows the lookup function to return the desired value, even if the label in G10 isn't capitalized the same way as the index-column label it's intended to match.

HINTS, TIPS, QUESTIONS

Share your latest spreadsheet discovery through *PC Magazine's* Spreadsheets. We'll pay you \$50 for any tip we print. Please submit your letter on a disk, together with a printout. Mail your contributions to Spreadsheets, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 8 for access instructions). ■

by
Costa Rodis

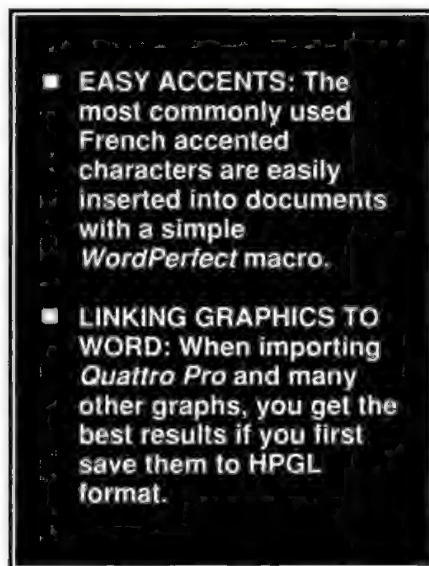
The Working Word

EASY ACCENTS

Recently, I needed to type some documents in French using *WordPerfect 5.1*. Naturally, I ran into the problem of typing accents and having to look up the ASCII codes that produce them.

The *FRENCH.WPM* macro (which is shown in Figure 1) offers a simple solution to this problem. It assigns the most-commonly used accented letters (à, â, é, ê, ë, î, ô, û, ü, and ç) to number variables. You can then insert the needed character into a document simply by pressing Alt together with the number you assigned to that letter. I entered the accented characters into the macro by holding down the Alt key and typing the character code on the numeric keypad.

I used {STATUS PROMPT} to show which Alt-number combination corre-



sponds to which accented letter. I find this an interesting if little-used technique.

Colin Mitchell
Scotland, United Kingdom

PC Assigning characters to variables does make it easier to type French or other languages with our standard U.S. keyboard configuration. Mr. Mitchell's macro might even be more convenient than *WordPerfect's* Compose key feature (discussed in this column, February 26, 1991). With Ctrl-V, you have to either guess at the characters that will generate the accented letters or consult the manuals for the correct ones. Unfortunately, this technique limits the number of characters to ten, since Alt-key variables can be assigned only to single-digit numbers. Nonetheless, Mr. Mitchell has chosen the most commonly used French accents. This should ease most people's grumbling when they attempt to type French text.

What makes this macro interesting is its use of the {STATUS PROMPT} command. Unlike the more commonly used {PROMPT} code, {STATUS PROMPT} retains a message at the bottom of the screen at all times. Except for the current

document name, which usually rests at the bottom of the screen, all native *WordPerfect* prompts replace the macro's message temporarily. Only exiting from *WordPerfect*, using an {INPUT} command after {STATUS PROMPT}, or invoking {STATUS PROMPT} without a message will eliminate the message. To this end, I've created a very simple macro called *ENDACCNT.WPM*, consisting of the line {STATUS PROMPT}. Run it and the prompt for accents disappears. *ENDACCNT.WPM* along with *FRENCH.WPM* is available on PC MagNet.

LINKING GRAPHICS TO WORD

Spreadsheet graphs are probably the item most commonly imported into *Microsoft Word*. The Library Link Graphics option will accept a variety of graphic formats. However, not all the desktop publishing features in *Word* can be used with every graphic format. For instance, you can't directly import a *Quattro Pro* graphic and print it to a Hewlett-Packard laser printer. The *Microsoft* program does have an HPGL input format option in Library Link Graphic, so you can import *Quattro Pro* graphs if you first save them to HPGL format.

The procedure is fairly straightforward. First change the printer option in *Quattro Pro* to an HP Plotter/Color Pro driver and then print the graphic to disk. An ASCII file of HPGL commands results. You should make sure the top and left margins in *Quattro Pro* are set to zero. In this way, a full-size plot is produced, and the *Word-HPGL* translator has complete control over the size and placement of the graphic within the *Word* document. If the graph is not output as a full page, *Word* will not be able to control the scale and position of the graphic. Both the placement and the content of the graph can be seen with *Word's* preView option. Best of all, the colors, patterns, and fonts of the graph are translated into a very nice monochrome image. The graph in Figure 2 should give

FRENCH.WPM

```
{:}Assign-french-letters-  
{:}to-Alt-number-keys-
```

```
{DISPLAY OFF}  
{ASSIGN}1~à~  
{ASSIGN}2~â~  
{ASSIGN}3~é~  
{ASSIGN}4~ê~  
{ASSIGN}5~ë~  
{ASSIGN}6~î~  
{ASSIGN}7~ô~  
{ASSIGN}8~û~  
{ASSIGN}9~ü~  
{ASSIGN}0~ç~
```

```
{STATUS PROMPT}  
{^Q}Alt-1(^){^}à  
..(^Q}2(^){^}â  
..(^Q}3(^){^}é  
..(^Q}4(^){^}ê  
..(^Q}5(^){^}ë  
..(^Q}6(^){^}î  
..(^Q}7(^){^}ô  
..(^Q}8(^){^}û  
..(^Q}9(^){^}ü  
..(^Q}0(^){^}ç~
```

Figure 1: This *WordPerfect 5.1* macro assigns the most commonly used French accented letters to numbers and places a menu at the bottom of the screen. To insert one of the characters listed, simply press Alt together with the assigned number.

The Working Word

you a good indication of the procedure's success.

I've found the above method works best; but there are four other methods for linking a graphic to *Word*. Here they are, with some notes on their limitations:

- Use the CAPTURE.COM program provided with *Word* to capture a graphic screen. The resulting bitmap can be scaled, positioned, and previewed in *Word*, but the printed result is not ideal, because the 300-dot-per-inch printer resolution far exceeds that of my EGA screen.

- Save a graphic as a Lotus .PIC file. Unfortunately, many of the formatting and font features available in *Quattro Pro* and other programs are lost in the process. The linked .PIC file can be scaled, positioned, previewed, and printed, but the result is not a very sophisticated graph.

- Save a graphic as an Encapsulated PostScript (.EPS) file. Unfortunately, you must use a PostScript printer to print out the imported graphic. Moreover, *Word*'s preview feature will not display an .EPS graphic. Only its location is shown.

- Print a graph to disk using the HP LaserJet driver and import it into *Word* as a printer file. This method works, but *Word* cannot change the graphic size or location on the page. PreView displays only the location and size of the graphic as specified in *Word*, not the actual location and size recorded in the printer file. There is no way of truly knowing how the graphic will look until it is printed.

Gordon Harris

Almonte, Ontario, Canada



The technique Mr. Harris prefers to use is the best method for importing graphic images into *Microsoft Word 5.0*. He uses *Quattro Pro* to produce graphs, but the procedure will work with any graphics program that can print to disk with an HPGL printer driver.

Any image created by a
Windows program can
be captured by the
Windows Clipboard
and then simply
inserted into a *Word*
for Windows
document.

Encapsulated PostScript (.EPS), Lotus (.PIC), *PC Paintbrush* (.PCX and .PCC), tagged-image file format (TIFF), and *Windows* Clipboard files can also be imported into *Word*.

Placing the graphic image at just the right spot on the page is a simple matter. Type the filename of the image and move the cursor to the Alignment In Frame menu choice. Tap the F1 key to choose between left, right, or center. If the image is as wide as the current margins, center is your only choice. To change the size of the image, move the cursor to Graphics

Width or Graphics Height and tap F1. Adjusting the amount of space between the top and bottom of the image and your text is simply a matter of entering the amount of space desired in the Space Before and Space After fields. When all of these adjustments have been made to your satisfaction, tap the Enter key. If the image format is one that *Word* will not import, an error message will appear and you will be invited to try again.

Word for Windows users, on the other hand, can directly import only TIFF graphic files. To do so, select Insert Picture and enter the full path- and filename. The image will appear at the current location of the cursor. You can size the image by clicking on it. A box will appear around the image with a tab at each corner and at the center of each line that forms the box; the tabs are called *sizing handles*. Point to a sizing handle and depress the left mouse button to crop the image. If you hold down the Shift key while pressing the left mouse button, you can shrink or enlarge the image. To move the image to a new location, simply drag the cursor over it, point to the new location, and tap the right mouse button while holding down the Ctrl key.

As for other file formats, any image created by a *Windows* program need only be captured by the *Windows* Clipboard and then inserted into a *Word for Windows* document. To copy an image to the Clipboard, open the appropriate file with the *Windows* program that created it. Select the image you wish to copy with an editing tool and choose Copy from the Edit menu. The image is now saved into the Clipboard. Exit the program or switch into *Word for Windows* and place the cursor where you want the image to appear. Choose Edit Paste, and the graphic image will be imported from the Clipboard into your document. At this point you can crop, size, and move the image as described.

TIPS FROM WORKING WORDSMITHS

Tell fellow users about your latest word processing tips, and we'll pay you \$50 for any tips we print. Please send your letter on a disk along with a printout. Mail your contributions to The Working Word, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see the PC MagNet News page, immediately following the Utilities column, for access instructions).



Figure 2: When importing a *Quattro Pro* graph into *Word*, you'll get the best results if you first save the graph as an HPGL file. Such a graph is shown here in *Word*'s print preview. The printed image keeps this position and shape, but the labels and chart sections will be far clearer.

by
Neil J. Rubenking

User-to-User

CHANGING COMMANDS

A frequent topic of conversation among librarians and school personnel who supervise public-access computers is how to keep the users/kids/students from modifying the hard disk. The first step, of course, is to remove `FORMAT.COM` and any powerful utilities such as *PC Tools* or the *Norton Utilities* from the hard disk. But you can make your computer even more secure by disguising some of DOS's more "dangerous" internal commands.

When you type one of the internal commands on your keyboard, `COMMAND.COM` interprets the keystrokes for DOS. To change these built-in functions, you can change its reference in `COMMAND.COM` to something else. In the following example, the command that produces a directory—`DIR`—will be changed to `RID`.

- Format a disk in the A: drive and copy `COMMAND.COM` to this disk. It's easier to work on `COMMAND.COM` on a floppy, because there will be fewer files to scan.

- Run *PC Tools* and select Drive A: as the disk to access. [If you don't have *PC Tools*, don't worry! There are other ways to accomplish the same thing, as you'll see below.—Ed.]

- Use *PC Tools*' F (find) function to find the ASCII string `DIR ($44 $49 $52)` in the `COMMAND.COM` file. You'll find this string in a mass of capitalized DOS commands, each separated from the next by graphics characters. The sector should read something like this:

```
...NOTnnERRORLEVELnnEXISTnnDIRnn  
RENAMEnnRENnn...
```

where the *nn*'s represent the separating code.

- With the cursor on the \$44 of the `DIR`, change it to \$52. And change the \$52 to \$44. The display to the right should now show `RID` replacing the old `DIR` command. Of course, `DIR` isn't very dangerous, but you can modify any of the potentially unsafe commands in this manner as well. Just reverse the first and last character for each

■ **CHANGING COMMANDS:**
Patch `COMMAND.COM`
or other binary files to
hide some commands
and make others more
useful.

and press the F5 key to write the changes to the disk. (You can rename the commands to whatever you like, as long as the names you choose aren't reserved for any other function and as long as they remain the same length as the originals.)

- Erase the old `COMMAND.COM` from your hard disk or (if you want to keep it) rename it to, say, `COMMAND.OLD`. Copy the new `COMMAND.COM` from the floppy disk. Reboot the computer from the hard disk, and you're in business.

Keep a record, though, of any major changes to DOS commands. It can be very embarrassing to forget a vital command when you want to use it!

Stanley Planton
Chillicothe, Ohio



Before you patch `COMMAND.COM`, make sure you can boot your system from a floppy. Is your hard disk partitioned by DOS or by a third-party driver? If the latter, copy the driver to your boot floppy and create an appropriate `CONFIG.SYS`. Also, copy any other drivers essential to your system's operation. If your patching makes `COMMAND.COM` dysfunctional, you won't be able to boot disk. That's why you need

the insurance of a bootable floppy disk. Of course, if you normally boot from a floppy, `DISKCOPY` that floppy before modifying `COMMAND.COM`.

When you rename a DOS command, be sure to enter the name in capital letters. DOS translates command input into uppercase before comparing it with the list of command names, so if your new command name has any lowercase letters, no

input will ever match it. This can be an advantage—if you want to disable a command completely, just replace it with the same name in lowercase, for instance change `ERASE` to `erase`.

Disabling dangerous commands may give your machine a modicum of safety, but don't relax yet. Even if you do disable the `ERASE` and `DEL` commands, users can probably find ways to delete files. If the machine has `BASIC`, the `KILL` command does the job, and many large applications have file management modules. For example, in *WordPerfect*, deleting a file is easy in the List Files window. The best protection for a public-access computer is a full daily backup.

There's another common reason for patching programs—to change the internal messages. In earlier versions of DOS, wags often changed the "Abort, Retry, Ignore?" message to "Abhor, Retch, Ignite?" A more useful change is to replace the final e in "Format complete" with a ^G character in the `FORMAT` program. Especially with high-density disks, it's nice to have an audible reminder when formatting is finished.

PC Tools doesn't come as standard equipment on every PC. However, `DEBUG`, `FIND`, and the batch language *do* come with every PC's DOS, and I've written a monster batch file, `CHANGE.BAT` (Figure 1), that automates the process of replacing one string with another in a binary file. To make the above-mentioned patch to `FORMAT.COM`, you'd enter

```
CHANGE FORMAT.COM complete  
complet^G
```

Press Ctrl and hit G to get the ^G character.

`CHANGE.BAT` creates quite a few temporary files, both batch files and `DEBUG` scripts, and takes a minute or two to run. To speed it up, copy `CHANGE.BAT`, `FIND`, `DEBUG`, and the file to be patched to a RAM disk. `CHANGE.BAT` depends on the `CALL` command—you can't use `COMMAND /C` instead. So you need

User-to-User

DOS 3.3 or later to run it.

CHANGE.BAT can't change strings with embedded spaces or other delimiters, but you can simulate spaces in your *replacement* string using ASCII character 255. This character appears on the screen as a space, but it doesn't separate command line arguments the way a real space does. In general, the search and replace strings should be the same length. If you replace a string with a shorter string, some of the original string will still be visible. For example, if you replace Abort with Stop, you'll get Stopt. If the replace string is longer, you may overwrite the data or code that follows the search string. That's when you reach for the bootable disk with a clean copy of **COMMAND.COM**.

How does CHANGE.BAT work? The best way to understand it is to read the program code—the numerous comments explain what each section is doing. (In fact, there are enough comments that they slow down the program's execution. You may want to create a working copy without comments.) For the most part, it creates

DEBUG scripts and secondary batch files that work together to get necessary information from DEBUG and store it in environment variables (e-vars). If the program

If the environment is allowed to expand, a patch could get written to the wrong address. So the first thing the batch file does is fill out the environment to its full size.

succeeds, it deletes all of the files and e-vars at the end. If there's trouble, it leaves them alone so that you can study them to see what went wrong.

The first thing the batch file does is as-

sign values to all of its environment variables. This is *extremely* important—if the environment expands, DEBUG may load programs at a slightly higher segment address. If the program-loading address changes between the time we get the search string's address and the time we write the replace string, the patch will go to the wrong address. So we fill out the environment to its full size before beginning.

DEBUG won't write changes to .EXE or .HEX files, and CHANGE.BAT can't handle files over 64K. So the next thing it does is check for the string ".EXE" or ".HEX" in the filename. Then it checks to be sure the file is 64K or less. When DEBUG loads a file, it stores the file size in BX:CX. If BX isn't 0000, the file is bigger than 64K.

Assuming the file extension is okay and the file isn't too big, we get the value of CX into the e-var length. And now that we know the length, we can create a DEBUG script that will search for all occurrences of the desired string. We pipe the output of that script through the FIND filter twice, filtering out everything except the actual address or addresses.

Next we use **FIND** with its **/C** switch to count the number of times the string was

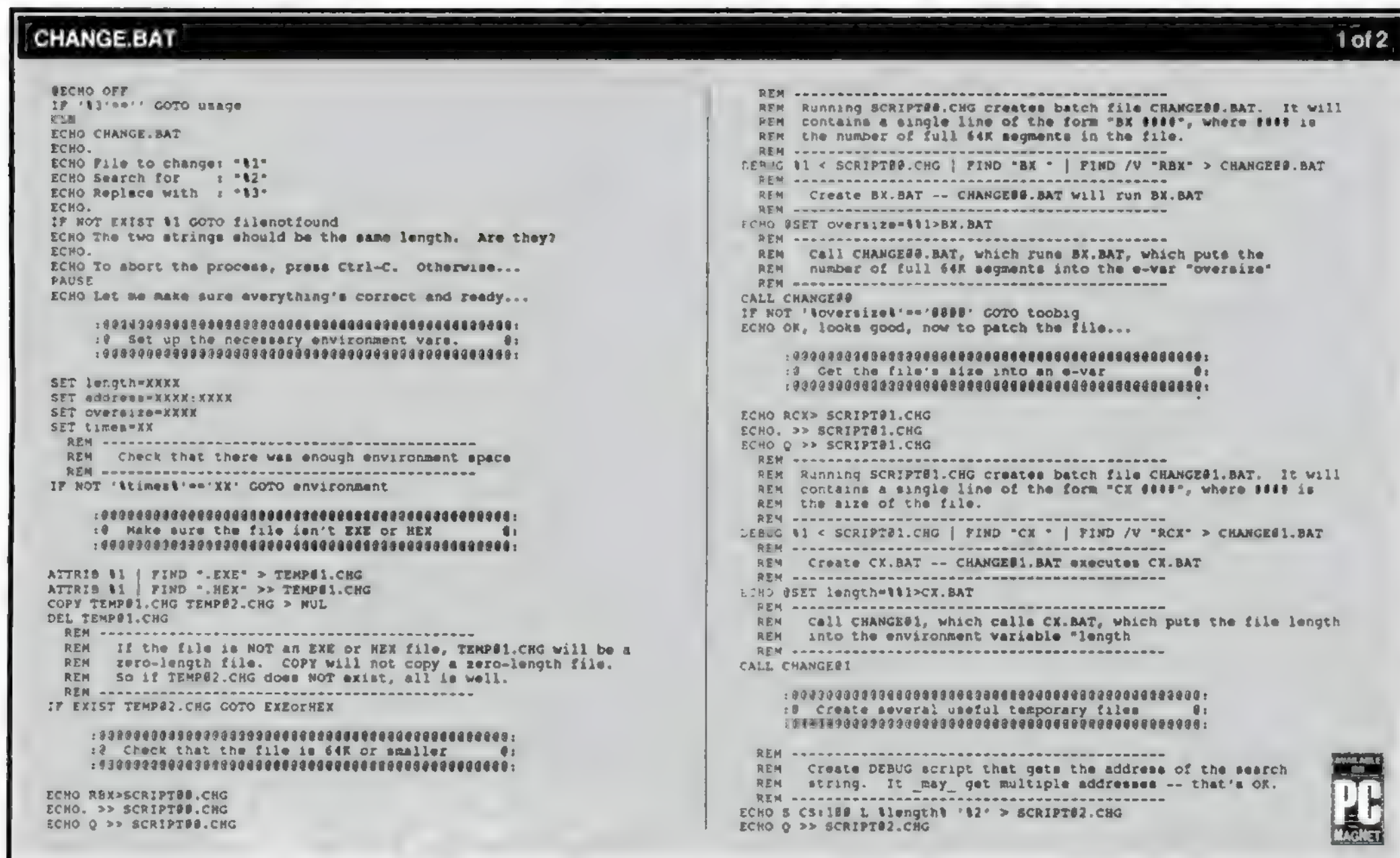


Figure 1: CHANGE.BAT searches a binary file for one string and replaces it with another.

CHANGE.BAT

2 of 2

```

REM -----
REM Create -----, which is called by CHANGE04.BAT to get
REM the number of times the file appears into e-var "times"
REM -----
ECHO %SET times=%1%2%>%.BAT
REM -----
REM Create and run a DEBUG script. When run, it produces the file
REM DATA1.CMG, containing the string "CHANGE07" with no carriage
REM return or line feed.
REM -----
ECHO NOATA01.CMG>CHANGE04.SCR
ECHO E 100 'CHANGE07' >>CHANGE04.SCR
ECHO RCX>>CHANGE04.SCR
ECHO 9>>CHANGE04.SCR
ECHO H>>CHANGE04.SCR
ECHO O>>CHANGE04.SCR
DEBUG < CHANGE04.SCR > NUL
REM -----
REM Create CHANGE07, which is called by CHANGE02 to get the address
REM of first occurrence of search string into e-var "address".
REM -----
ECHO %SET address=%1%1 > CHANGE07.BAT
:*****
:0 Finally, create and run a script that 0:
:0 performs the replacement. 0:
:*****
:notfirst
REM -----
REM Running SCRIPT02.CMG finds address(es) of search string
REM -----
DEBUG 11 < SCRIPT02.CMG | FIND /V "02" | FIND "1" > TEMP03.CMG
REM -----
REM FIND with the /C (for Count) switch produces output of
REM the form "----- TEMP03.CMG: 0", where 0 is the
REM number of times the search string occurs in the file.
REM -----
FIND /C "1" TEMP03.CMG > CHANGE04.BAT
REM -----
REM Call CHANGE04, which calls -----.BAT
REM -----
CALL CHANGE04
REM -----
REM If the search string is not present, get out
REM -----
IF "times"=="0" GOTO notfound
REM -----
REM Pre-pend DATA1.CMG to the first line of the file of addresses
REM to create CHANGE02.BAT. Running CHANGE02.BAT puts the address
REM of the first occurrence of the search string into an e-var.
REM -----
COPY DATA1.CMG + TEMP03.CMG CHANGE02.BAT > NUL
CALL CHANGE02
REM -----
REM Create DEBUG script that overwrites the data at the address
REM of the search string with the replace string.
REM -----
ECHO E (address) "03" > SCRIPT03.CMG
ECHO M >> SCRIPT03.CMG
ECHO Q >> SCRIPT03.CMG
REM -----
REM Perform the replacement and look for errors.
REM -----
DEBUG 11 < SCRIPT03.CMG | FIND "Error" > TEMP04.CMG
COPY TEMP04.CMG TEMP05.CMG > NUL
DEL TEMP04.CMG
REM -----
REM If there were no errors, TEMP04.CMG is a zero-length file.
REM DOS will not copy a zero-length file. So if the copy does
REM NOT create TEMP05.CMG, all is well.

```

```

REM -----
IF EXIST TEMP05.CMG GOTO trouble
:*****
:0 If the search string occurred more than 0:
:0 once, repeat the process. 0:
:*****
IF "times"=="1" GOTO success
ECHO The string "02" appears in the file 01 times.
ECHO Replacing next occurrence...
GOTO notfirst
:*****
:0 Here is the code for ending the batch 0:
:0 file, successfully or otherwise. 0:
:*****
:success
ECHO.
ECHO I have successfully patched the file 01 to replace all
ECHO occurrences of "02" with "03". I will now delete all
ECHO of the temporary files created in the process.
:cleanup
IF EXIST SCRIPT02.CMG DEL SCRIPT02.CMG > NUL
IF EXIST TEMP03.CMG DEL TEMP03.CMG > NUL
IF EXIST CHANGE07.* DEL CHANGE07.* > NUL
IF EXIST CX.BAT DEL CX.BAT > NUL
IF EXIST SX.BAT DEL SX.BAT > NUL
IF EXIST -----.BAT DEL -----.BAT > NUL
IF EXIST DATA1.CMG DEL DATA1.CMG > NUL
FOR /V %I IN (length address times oversize) DO SET %I=
GOTO end
:filenotfound
ECHO You're asking me to change the file "01", but I don't
ECHO see any file with that name!
GOTO end
:toobig
ECHO Sorry, CHANGE.BAT only works on files 64K or smaller
GOTO cleanup
:notfound
ECHO Sorry, the file 01 does not contain the string "02".
GOTO cleanup
:usage
ECHO USAGE: CHANGE filename searchstring replacestring
ECHO.
ECHO The file to be changed must be 64K or less in size, and it
ECHO must not have an .EXE or .BIN extension. Also, the search string
ECHO and the replace string should be the same size.
GOTO end
:fixorwin
ECHO Sorry, you cannot use CHANGE on a .EXE or .BIN file.
ECHO to have another extension before running CHANGE.
GOTO cleanup
:environment
ECHO Sorry, you do not have enough available environment space
ECHO to run CHANGE.BAT.
GOTO cleanup
:trouble
DEL TEMP05.CMG
ECHO There was trouble in the final DEBUG process. Examine the
ECHO files created by CHANGE.BAT to see where the problem started.
ECHO Also, type SET and look at environment variables "oversize",
ECHO "address", "length", and "times".
:end

```

found and store the count in the e-var TIMES. If the string occurred 0 times, we exit with a message. Otherwise, we use more ancillary files to get the first address into the e-var ADDRESS. Finally we have all the information necessary to overwrite the search string with the replace string. We create yet another DEBUG script that does exactly that. Just in case, we filter the output and check for the string "Error". If an error occurred, we exit, leaving the temporary files intact for examination.

At this point, we've replaced the first occurrence of the search string with the replace string. If the string appeared more than once in the file, we loop back to replace the next one. Otherwise, we announce the success of the operation, delete

the numerous temporary files, and clear the environment variables.

The technique CHANGE.BAT uses most is that of treating a line of output data as a command. For example, it feeds DEBUG a script that gets the binary file's length and puts the line containing the data into a batch file. This line is "CX ####", where #### is the file length. If CX were a command, the batch file would call the CX command with the file's length as a command line parameter. CHANGE.BAT simply makes CX a command by creating CX.BAT. It uses the same technique to load the other three environment variables.

You can use this method and the other programming tricks in your own batch

files. If you find the program's operation difficult to understand, just skip the lines that delete the temporary files. Insert "GOTO end" right after the label :cleanup. Now, after you run CHANGE, the temporary files will remain on-disk for your examination.

SHARE YOUR SECRETS

Reveal your latest DOS and/or system discovery through User-to-User; we'll pay you \$50 for any submission we print. Please submit your letter on a disk together with a printout. Mail your contribution to User-to-User, PC Magazine, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 8 for access instructions).

Trade up to
IRMAtrac
and
save.



Sometimes you just need
a flexible board

IRMAtrac. The most flexible token-ring board in the world.

Within the myriad of connectivity options, you need to choose the path or paths that will protect your investment both now and in the future. Which is why we developed IRMAtrac™, our new, highly flexible token-ring board. IRMAtrac Token-Ring Adapter/Convertible is designed to adapt in three different ways, to cover all of the token-ring growth possibilities that face you.

Whether you're planning to move from twisted pair to fiber optic, 4 MBPS to 16 MBPS, or the standard PC environment to the MCA world of PS/2®, IRMAtrac's flexible architecture and modular design allow you to handle all of these environments.

That way, you can select the path that's right for your business, all the while enjoying the kind of reliability and IBM®-compatibility that make DCA's IRMA™ products so highly successful.



Yet our appeal doesn't stop at flexibility. IRMAtrac offers better performance due to on-board intelligence and bus-master technology.

And we're compatible with Novell® NetWare® 286 and 386, IBM PCLAN Program, DCA 10NET®, Microsoft® LAN Manager, 3 + Open™, and others. Plus, even more micro-computer architecture versions, such as Macintosh, will be available in the future. Which is highly unlikely from IBM.

What's more, until June 30, 1991, you can trade up to IRMAtrac and get a credit of up to \$420 for your old coax or LAN adapters. For more information contact your DCA dealer or call 1-800-348-DCA1 ext. 69A.*

Now more than ever, it's the
most flexible
offer you'll find.

DCA



CIRCLE 389 ON READER SERVICE CARD

*Offer good in U.S. and Canada only. ©1991 Digital Communications Associates, Inc. All rights reserved. DCA and 10NET are registered trademarks and IRMAtrac and IRMA are trademarks of Digital Communications Associates, Inc. All other brand and product names are trademarks or registered trademarks of their respective owners.

edited
by Trudy Neuhaus

Languages

MAKING C SING

I read about making Turbo Pascal emulate BASIC's PLAY statement (Languages, February 13, 1990) and decided to create a C program to play the tune "Take Me Out to the Ball Game." The program, BALLGAME.C (Figure 1), compiles under Microsoft C, Version 6.0.

Wayne D. Geiser
(on CompuServe)



Making C "sing" is no easy matter. But Mr. Geiser's program cleverly uses techniques that allow for consistent results, regardless of your PC's CPU speed. He does this by reprogramming the PC's 8253 timer chip, causing it to run four times faster than normal. The 8253 usually ticks 18.2 times a sec-

■ **MAKING C SING:** How to play music over your PC's speaker using C.

■ **UNIQUE FILENAMES:** Your Turbo Pascal programs can generate filenames guaranteed to be both unique and date-dependent.

ond, or once every .05495 seconds. But this is too slow for playing music: about every 100th of a second is much more appropriate.

An unfortunate side effect of speeding up the ticks of the 8253 can be that the PC's time-of-day clock begins to run too fast. But Mr. Geiser doesn't let this happen. To maintain the correct time of day, this program traps the time-of-day interrupt, 08h, and allows it to execute only every fourth tick produced by the faster 8253. Thus, BALLGAME.C begins with the `init_clock` function, which installs the new code for Interrupt 08h and is contained in the function `new_int`. Then, `init_clock` resets the 8253.

The actual music is played by calling the sound function in a loop. This function takes two arguments, which specify the frequency to be played and the duration to play that frequency. The function turns on the speaker at the specified frequency and

BALLGAME.C

1 of 2

```
#include <conio.h>
#include <dos.h>

/* The following are the frequencies for each note. An S following the note
   means that the note is a sharp (#). */
#define S 0.0 /* Silence */
#define C1 261.63
#define CS1 277.18
#define D1 293.66
#define DS1 311.13
#define E1 329.63
#define F1 349.23
#define FS1 369.99
#define G1 392.8
#define GS1 415.3
#define A1 440.8
#define AS1 466.16
#define B1 493.88
#define C2 523.25
#define CS2 554.37
#define D2 587.33
#define DS2 622.25
#define E2 659.26
#define F2 698.46
#define FS2 739.99
#define G2 783.99
#define GS2 839.61
#define A2 880.8
#define AS2 932.33
#define B2 987.77

/* The following are the durations of the notes. To make the song go faster,
   make the definition of E smaller. To make the song go slower, make the
   definition of E larger. A P in the second position of the name means that
   this note is half again as large as the one preceding it. */
#define E 0.125 // Eighth note
#define EP (E*1.5) // dotted 8th
#define Q (E*2.0) // quarter note
#define QP (E*3.0) // dotted quarter
#define H (Q*2.0) // half note
#define HP (Q*3.0) // dotted half
#define W (H*2.0) // whole note
#define WP (H*3.0) // dotted whole

/* The following define the duration of each note (or conversely, the amount
   of silence between notes. */
```

```
#define LEGATO 1.0
#define NORMAL 0.875
#define STACCATO 0.75

/* Changing this definition changes the duration of the notes for the entire
   song. */
#define NOTE_DUR NORMAL

/* How much must we speed up the timer. The value works fine for the tempo
   I've defined here. If you play a faster song, you might consider
   increasing this value. */
#define CLOCK_INC 4

#define NUM_NOTES 61
static double notes[NUM_NOTES] =
{
    C1, C2, A1, G1, E1, G1, D1,
    C1, C2, A1, G1, E1, G1, GS1,
    A1, GS1, A1, E1, F1, G1, A1, F1, D1,
    A1, A1, A1, B1, C2, D2, B1, A1, G1, F1, D1,
    C1, C2, A1, G1, E1, G1, D1,
    C1, D1, E1, F1, G1, A1, A1, B1,
    C2, C2, C2, B1, A1, G1, FS1, G1, A1, B1, C2
};

static double sizes[NUM_NOTES] =
{
    H, Q, Q, Q, Q, HP, HP,
    H, Q, Q, Q, Q, W, Q,
    Q, Q, Q, Q, Q, Q, H, Q, HP,
    H, Q, Q, Q, Q, Q, Q, Q, Q, Q,
    W, Q, Q, Q, Q, HP, HP,
    H, Q, Q, Q, Q, W, Q, Q,
    HP, HP, Q, Q, Q, Q, Q, Q, HP, HP, W
};

volatile long click = 0;
void (interrupt far *orig_int)(void); /* function pointer to the original
   interrupt */

void init_clock(void);
void reset_clock(void);
void asleep(double how_long);
void sound(double freq, double duration);

void main(void)
```

Figure 1: Executing this program will play "Take Me Out to the Ball Game." To play music on a PC, the 8253 timer chip must be reprogrammed. BALLGAME causes it to run four times faster than normal; however, it's written so as not to affect the time-of-day clock.


```

int i;

init_clock();
for(i = 0; i < NUM_NOTES; i++)
    sound(notes[i], sizes[i]);
reset_clock();
}

void interrupt far new_int(void)
{
    if(++click & CLOCK_INC == 0)
        (*orig_int)();
    outp(0x20, 0x20);
}

void init_clock(void)
{
    /* Increase the 8253 timer's channel 0 output by a factor of CLOCK_INC. */
    union
    {
        long divisor;
        unsigned char c[2];
    } count;

    /* Install the new interrupt routine. */
    orig_int = _dos_getvect(0x20);
    _dos_setvect(0x20, new_int);

    /* Increase the timer speed. */
    count.divisor = (long)65536 / CLOCK_INC;
    outp(0x43, 0x36); /* tell 8253 that count is coming */
    outp(0x40, count.c[0]); /* send low-order byte */
    outp(0x40, count.c[1]); /* send high-order byte */
}

void reset_clock(void)
{
    /* Return clock to it's original speed. */
    /* Reinstall the old interrupt routine. */
    _dos_setvect(0x20, orig_int);

    /* Slow down the clock. */
    outp(0x43, 0x36); /* tell 8253 that count is coming */
    outp(0x40, (char)0); /* send low-order byte */

    outp(0x40, (char)0); /* send high-order byte */
}

void sleep(double how_long)
{
    long i,
    orig,
    new;

    orig = click;
    i = (long)((how_long * (10.2 * CLOCK_INC)) + orig);
    new = click;
    while(new < i)
        new = click;
}

void sound(double freq, double duration)
{
    /* Beep the speaker using the specified frequency. */
    double off,
    play;
    union
    {
        long divisor;
        unsigned char c[2];
    } count;
    int p;

    play = duration * NOTE_DUR;
    off = duration - play;

    if(freq != 0)
        count.divisor = (long)(1193180 / freq); /* compute the proper count */
    else
        count.divisor = 0;
    outp(0x43, 0x36); /* tell 8253 that count is coming */
    outp(0x40, count.c[0]); /* send low-order byte */
    outp(0x40, count.c[1]); /* send high-order byte */
    p = inp(0x61); /* get existing bit pattern */
    if(freq != 0)
        outp(0x61, p | 3); /* turn on bits 0 and 1 */
    else
        outp(0x61, p);

    sleep(play);

    outp(0x61, p); /* restore original bits to turn off speaker */
    sleep(off);
}

```

sleeps (via the provided sleep function) for most of the duration. Then it turns the speaker back off and sleeps a fraction more. The last sleep allows you to create a smaller or larger silence at the end of each note, so you can produce a legato, normal, or staccato effect.

Finally, the program restores the time-of-day interrupt and resets the 8253 to its normal rate.

You can easily adapt BALLGAME to play your own tunes: simply use the macros that are provided (S, C1 through B2) to alter the note values stored in the notes array. S is for a silence—a musical rest—and C1 through B2 are note values over a two-octave range beginning with middle C. (You can define your own note values for a greater octave range.) The duration of each note is defined in the parallel array sizes (using E, Q, H, W, WP, and so on). E defines an eighth note, Q a quarter note, QP a dotted quarter note, and so on. Exactly how long each note lasts depends on the definition of E. In BALLGAME, it's defined as 0.125, creating an Allegro tempo with about 240 quarter

notes per minute (4 quarter notes per second).—Richard Hale Shaw

UNIQUE FILENAMES

I had a program that generated new files every 50 to 90 seconds (screen dumps and associated parameters), and I had to devise a way to name the files automatically. For several reasons, progressive numbers wouldn't do the job. So I decided to use the current date and time as a safe way to uniquely name each file. The problem was how to pack all the relevant data (year, month, day, hour, minutes, and seconds) into eight characters.

Turbo Pascal has a procedure called PackTime that packs all the data into a LongInt. The resulting LongInt can then be translated to eight hexadecimal characters and used as a filename. The main disadvantage of this solution is that the resulting filename is unintelligible to human users, because of its packing algorithm.

The solution I devised was a notation nicknamed *asciigesimal*. In its simplest form, it is a base 36 notation that can be seen as an extended hexadecimal. The

numbers 0 through 9 correspond to the characters 0 through 9. The numbers 10 through 35 correspond to the uppercase letters of the alphabet. This way, using a 24-hour system and counting years since 1980, one can pack year, month, day, and hour in just four characters. For example, noon of November 26, 1989, would become 9BQC.

I chose not to encode the minutes and seconds, since they just fit the remaining four characters. Thus, in the preceding example, if minutes were 36 and seconds were 53, the complete filename would be 9BQC3653. These filenames are easily decoded by anyone proficient in hexadecimal notation. Moreover, any utility that shows a sorted directory will list the files in order of creation.

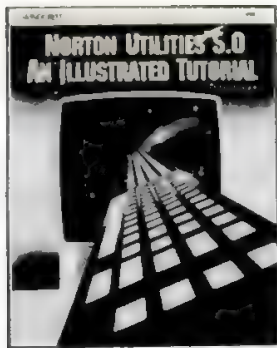
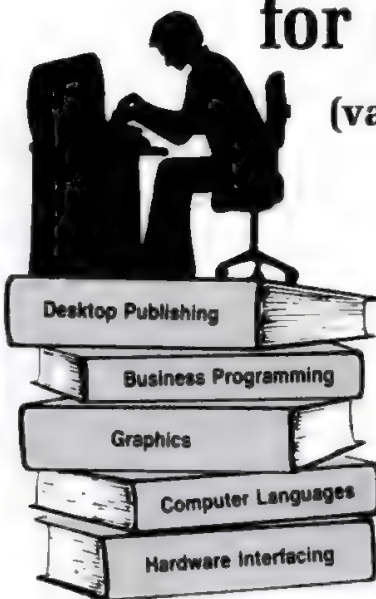
Pier-Luigi Lollini
Bologna, Italy



DOS function 5Ah (introduced with Version 3.0) will create a unique filename based on the time, but it has disadvantages. First, it creates and opens a file with the unique name.

SELECT 5 BOOKS for only \$4⁹⁵

(values to \$124.75)



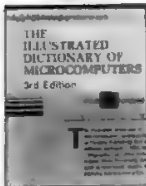
3720 \$26.95
Counts as 2



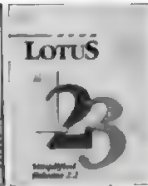
2959 \$31.95
Counts as 2



3332P \$24.95



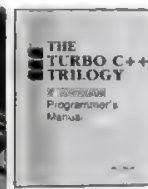
3368P \$19.95
Counts as 2



3440P \$18.95



15002P \$22.95



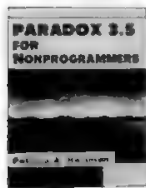
3300P \$24.95
Counts as 2



3161P \$24.95



8305P \$28.95
Counts as 2



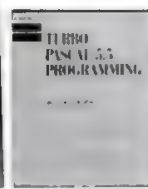
3418P \$21.95



3564P \$18.95



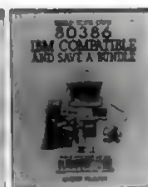
881307-7P \$22.95



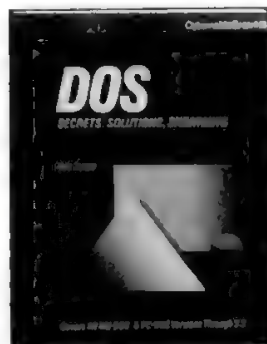
3537P \$18.95



3534 \$37.95
Counts as 2



3131 \$26.95
Counts as 2



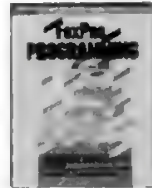
15008P \$24.95



3563P \$22.95



3679P \$22.95



3525P \$21.95



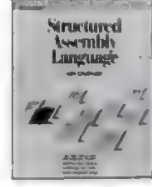
3283 \$28.95
Counts as 2



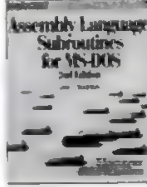
3382P \$29.95
Counts as 2



3418P \$26.95
Counts as 2



3484 \$34.95
Counts as 2

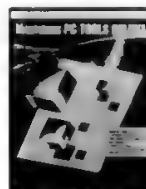


3649P \$34.95

When it's new and important in business or personal computing,
The Computer Book ClubSM has the information you need . . .
at savings up to 50% off publishers' prices!



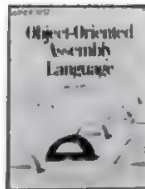
3049 \$37.95
Counts as 2



3678P \$16.95



3616P \$17.95



3620P \$24.95



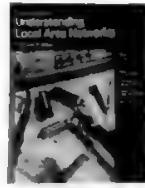
2817P \$14.95



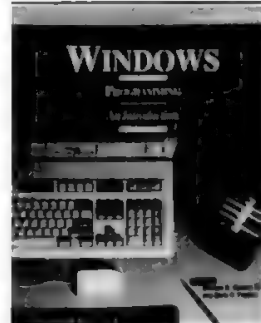
3204P \$21.95



3617P \$29.95
Counts as 2



8335P \$19.95
Counts as 2



15038P \$28.95
Counts as 2

All books are hardcover unless number is followed by a "P" for paperback. (Publishers' Prices Shown)
A shipping/handling charge and sales tax will be added to all orders.



The Computer Book ClubSM

Membership Benefits • Big Savings. In addition to this introductory offer, you keep saving substantially with members' prices of up to 50% off the publishers' prices. • **Bonus Books.** Starting immediately, you will be eligible for our Bonus Book Plan, with savings of up to 80% off publishers' prices. • **Club News Bulletins.** 15 times per year you will receive the Book Club News, describing all the current selections—mains, alternates, extras—plus bonus offers and special sales, with scores of titles to choose from. • **Automatic Order.** If you want the Main Selection, do nothing and it will be sent to you automatically. If you prefer another selection, or no book at all, simply indicate your choice on the reply form provided. You will have at least 10 days to decide. As a member, you agree to purchase at least 3 books within the next 2 years and may resign at any time thereafter. • **Ironclad No-Risk Guarantee.** If not satisfied with your books, return them within 10 days without obligation! • **Exceptional Quality.** All books are quality publishers' editions especially selected by our Editorial Board.

P501



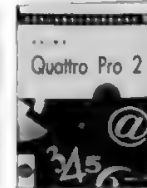
3330P \$18.95



3417P \$24.95
Counts as 2



3006P \$29.95
Counts as 2



881704-8P \$24.95
Counts as 2



3111P \$17.95



881708-4P \$24.95

If card is missing, use this address to join: © 1991 THE COMPUTER BOOK CLUB
Blue Ridge Summit, PA 17294-0820
CIRCLE 311 ON READER SERVICE CARD

Languages

UNIQUE.PAS
COMPLETE LISTING

```

PROGRAM Unique;
USES Dos, Crt;
CONST AG : ARRAY[0..35] OF CHAR =
  '0123456789ABCDEFGHIJKLMNPOQRSTUVWXYZ';
  (these are the "ascii" decimal characters)

VAR OneName : NameStr;

FUNCTION UniqueName : NameStr;
VAR Year, Month, Day, Dummy,
    Hour, Min, Sec : Word;
    temp : NameStr;
BEGIN
  GetDate(Year, Month, Day, dummy);
  GetTime(Hour, Min, Sec, dummy);
  temp := AG[Year-1980]*AG[Month]*AG[Day]*AG[Hour];
  temp := temp*AG[Min DIV 10]*AG[Min MOD 10]*
    AG[Sec DIV 10]*AG[Sec MOD 10];
  UniqueName := temp;
END;

PROCEDURE When(Name : NameStr);
VAR Year, Month, Day,
    Hour : Word;
    Min, Sec : String[2];
BEGIN
  Year := pred(pos(name[1], AG)) + 88;
  Month := pred(pos(name[2], AG));
  Day := pred(pos(name[3], AG));
  Hour := pred(pos(name[4], AG));
  Min := Copy(name,5,2);
  Sec := Copy(name,7,2);
  Write('Filename: ',name,' Date/Time: ');
  WriteLn(month,'/',day,'/',year,' ',hour,':',min,':',sec);
END;

BEGIN
  REPEAT
    OneName := UniqueName;
    When(UniqueName);
    Delay(500);
  UNTIL KeyPressed;
END.
  
```



Figure 2: The UniqueName function produces a filename based on the current date and time. You can use this with Turbo Pascal 4.0 and later.

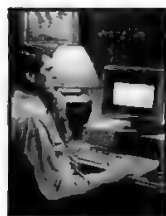
Most Turbo Pascal programs would have to close the file using DOS services and re-open it as a Turbo Pascal file variable. Second, the resulting filenames can't be interpreted in any useful way.

I wrote UNIQUE.PAS in Figure 2 to illustrate Mr. Lollini's idea. It repeatedly creates a filename for use at the current moment and then translates that filename back into the date and time from which it was created. When you press a key, it stops. Of course, if you needed to create two files within a single second, it would return the same name. If there's a chance that might happen in a program using the UniqueName function, just put a "Delay(1000);" statement before the next call to UniqueName.—Neil J. Rubenking

SPEAK YOUR LANGUAGE

Share your knowledge of BASIC, C, Pascal, FORTRAN, and COBOL with Languages readers; we'll pay you \$50 for any tips we print. Please send a disk along with a printout. Mail your contribution to Languages, PC Magazine, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 8 for access instructions).

Print Master® lets people share printers



Get the most out of your expensive resources—your people, your computers and your printers—with Print Master by BayTech. Not only does it let your people and computers share all of your printers, its buffer keeps them working instead of waiting.

Easy to set up, easy to use

Initial setup is menu prompted and allows you to configure Print Master to your application. You decide which ports are input and which are output. You also set such functions as baud rates, handshaking, timeout, how you select a printer, etc. After setup, you simply cable Print Master between your computers and printers and you're ready to go. BayTech's Memory Resident Program lets your PC users select printers via function keys that correspond to a menu window.

Print Master keeps everything running

All users can send data simultaneously to Print Master's dynamically allocated buffer keeping your people and computers working. This feature's unique buffer allows multiple data to print simultaneously to keep them waiting at full capacity. The buffer size is a big MB that's expandable to 128 megabytes.

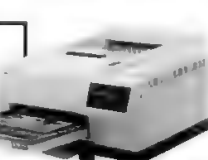
Eleven models with serial and parallel

An advantage of Print Master is its flexibility. Any port can be a computer port or a printer port. Choose from eleven models with different combinations of serial and parallel ports. Print Master internally converts serial to parallel and vice versa on combination serial/parallel models. Six, eight and ten port models available.

Non-buffered models from \$338. GSA pricing available.

Want details?

Contact your dealer or Bay Technical Associates for information about Print Master and BayTech's complete line of data communications products, proudly made in the U.S.A.



BayTech

Bay Technical Associates, Inc.
Data Communications Products Division
200 N. Second St., P.O. Box 387
Bay Saint Louis, MO 63020
Phone 501-467-0231 or
800-683-8708

Great Performances



Demand an Encore

Let us take your article to its highest level of marketing potential with a reprint!

To find out how you can have your article or review elegantly reprinted ** on 80 lb. paper stock, in 4-color, 2-color or 1-color, call or write today:

Jennifer Locke—Reprints Manager;
Ziff-Davis Publishing Company,
One Park Avenue, New York, NY 10016, 212-503-5447.

**Minimum quantity 500 reprints.

by
Jeff Prosis

Tutor

SHADOW RAM

What exactly is shadow RAM? It can be turned on or off through the setup screen on my 20-MHz 386 machine. I've tried it both ways, but I notice very little difference in performance. There is one oddity, though: when I have shadow RAM enabled, *386MAX* locks up my PC. What could be the reason for this?

Alain Proux

Saint-Germain-en-Laye, France



Shadow RAM is a feature of many 386 PCs that lets 32-bit RAM run code contained in the slow BIOS or adapter ROM. At start-up, designated regions of memory are copied from ROM to RAM. When a program attempts to read code or data from one of these remapped ROMs, the 386 delivers it from high memory instead.

This technique, known as shadowing, is valuable because most BIOS and adapter ROMs can be accessed only 8 bits at a time. This was fine in the old days, when CPUs could handle data only in 8-bit chunks, but it throttles performance on today's 386 PCs. You can access 32-bit RAM much more quickly, partly because it can be read in chunks four times as large and partly because its access time is typically much lower than that of ROM. The speedier access cuts down the time required to read the contents of a memory location and enables the CPU to spend less time waiting and more time working. Shadowing can even map 16-bit RAM and ROM to 32-bit RAM; however, the gains aren't as high as they are when mapping 8-bit memory.

Do applications access ROM locations often enough for shadowing to make a difference in performance? In most cases, the answer is yes. Most programs written for DOS—and even DOS itself—call on routines embedded in ROM extensively. The BIOS contains an assortment of built-in routines for handling everyday tasks such as writing characters to the screen, reading the keyboard, performing low-

- **SHADOW RAM:** Use this feature to speed up performance on your 386 machine.
- **A LOGICAL ALTERNATIVE:** High performance and relatively modest prices make the IDE interface hard to beat.
- **STREAMLINING REMOVE.COM:** Patch our REMOVE utility so that you don't have to respond to its prompt.
- **THE RIGHT ALT KEY:** Check for the presence of DOS's KEYB command if your right Alt key doesn't seem to work.

level disk I/O, and sending output to the printer. When a program running on a 386 machine invokes one of these routines, the CPU has to mark time between instruction fetches waiting for the next byte of code to be delivered. However, if the contents of ROM have been moved to a region of memory populated by 32-bit RAM, the bytes can be delivered much faster and, consequently, idle time is minimized. On 386 systems, it can take 10 to 20 times longer to read a byte from 8-bit ROM than from 32-bit RAM. If a program spends 10 percent of its time executing ROM routines, shadowing can speed up overall system performance by as much as 8 to 9 percent.

Some systems enable shadowing through special hardware that redirects memory access from one location to another. With the aid of 386 memory managers such as *386MAX* and *QEMM-386*, it's possible

to implement shadowing in software. These programs take advantage of the 386's ability to transform linear addresses (memory addresses generated with combinations of segment and offset registers) into physical addresses. This process, called *paging*, divides all of memory (up to 4GB on a 386) into a series of 4K pages and allows any page to be mapped to any other page address in memory. (Paging was discussed in detail in *PC Magazine's* January 16, 1990, Tutor column.)

For example, using a PC with 2MB of RAM and a 128K ROM BIOS with a base segment address of E000h, shadowing might relocate the BIOS to the region of memory based at segment 24000h. Then, any code or data requested from segment E000h would actually come from 24000h. Assuming the upper 128K of memory is populated with 32-bit RAM while segments E000h and F000h are filled with 8-bit ROM, a routine run from the BIOS might run an order of magnitude faster. The program that called the BIOS routine is unaware of the indirection that took place in the background.

It is probably a paging conflict that's causing *386MAX* to lock up your PC. There is a simple solution: Turn shadowing off on your PC and let *386MAX* do it instead. *386MAX* scans your system for ROM at start-up, performs speed tests on all the RAM and ROM it finds, and swaps slow regions of memory for fast ones. It also provides other services—such as transforming extended memory into EMS 4.0-compatible expanded memory—which your PC's BIOS probably doesn't offer.

Shadow RAM's only drawback is that it requires memory that you could be using for other things. Those 386 users with exactly 1MB of memory on their machines were surprised when *Lotus 1-2-3*, Release 3, would not run for lack of memory. The reason: The RAM devoted to shadowing is effectively subtracted from the system. IBM's Model 70, for example, sets aside the uppermost 128K of memory for shadowing. This leaves a 1MB

Tutor

machine with only 896K of usable RAM. Users who could not turn shadowing off were left with two choices: forget about 1-2-3, Release 3, or buy more RAM.

Under DOS, extended memory can be used for RAM disks, disk caches, or (with certain applications) for data buffers. With a 386 memory manager that enables programs to run in Virtual 8086 mode, extended memory can be used to backfill holes in the first megabyte and move TSRs and device drivers out of low memory. In OS/2, extended memory can be used for code and data just like any other memory. So the choice is yours. But remember: If you have extended memory going to waste, devote a portion of it to shadowing; it's an inexpensive way to increase your PC's performance.

A LOGICAL ALTERNATIVE

In the October 30, 1990, Tutor column, you explained the differences between ST506/412, ESDI, and SCSI drive interfaces, but you didn't mention IDE drives and controllers. What does IDE stand for, and how does it compare with the other popular drive interfaces?

Mitchell Shnier
Toronto, Ontario
Canada



IDE stands for *Integrated Drive Electronics*. As an interface, IDE falls somewhere between ST506/412 and SCSI. Like ST506/412, IDE operates at the device level, meaning that it provides a direct, low-level link between the drive and its host. Like a SCSI drive, however, an IDE drive contains all the control logic on the drive itself rather than on the controller card. It also transfers data in parallel, 16 bits at a time, whereas ST506/412 (and ESDI) drives transfer data in serial form. As a result of these design enhancements, the IDE interface offers ESDI-like performance at ST506/412-like prices—a hard combination to overlook when you want to get the most for your money.

IDE owes its popularity in part to the several major clonemakers who recently began building IDE interfaces into the system boards of their personal computers. This makes it a snap to install IDE drives into these manufacturers' PCs, and it eliminates the need to purchase a sepa-

rate drive controller. Making this component an integral part of the system is practical because, lacking the control electronics found on conventional drive adapters, IDE adapters are proportionally less expensive to manufacture.

Like ESDI and SCSI drives, IDE drives are available in a wide range of capacities, up to several hundred megabytes. A quick survey of catalog prices shows that a typical IDE drive can be purchased for about 80 percent of the cost of an ESDI drive of equal capacity. This, combined with the comparatively high levels of performance obtainable from IDE drives, makes IDE an attractive alternative to ST506/412 and ESDI for today's PCs.

STREAMLINING REMOVE.COM

I use *PC Magazine's* INSTALL and REMOVE utilities to manage the TSRs on my system. When you run REMOVE, it pauses and asks you to press Enter to remove the last TSR (or set of TSRs) installed or Esc to abort. I'd like to be able to run the program from a batch file without having it prompt for confirmation. Is there any way to patch REMOVE with DEBUG to omit the prompt?

Jesse D. Parris
Stamford, Connecticut



There sure is. Go to the directory where REMOVE.COM is stored and type

DEBUG REMOVE.COM

E 01FC EB 13

W

Q

Of course, you'll need to make sure that DEBUG is in the same directory or in a directory named in your PATH statement. You may also want to make a backup copy of REMOVE.COM before patching it, so that if something goes wrong, you'll still have the original.

This sequence of DEBUG commands places a machine language JMP instruction (similar to a GOTO in BASIC) in the program, causing the program to bypass the routine that solicits a keypress. After you're done, REMOVE will no longer display the message "Press ENTER to remove, ESC to abort," nor will it wait for a keypress. It will, however, display a count of the programs installed and list their names. If you'd like to suppress this output, redirect output to the NUL device with the command **REMOVE > NUL**.

THE RIGHT ALT KEY

I recently bought a 286 clone with a 101-key Enhanced-style keyboard. When I discovered that the Alt key on the right side of the keyboard didn't work, I returned the computer to the dealer who changed something in the CONFIG.SYS and AUTOEXEC.BAT files and corrected the problem. Later, after experiencing other problems, I reinstalled DOS, and guess what? The right Alt key no longer worked! What on earth could be causing this to happen?

Kenneth H. Etner
Allentown, Pennsylvania



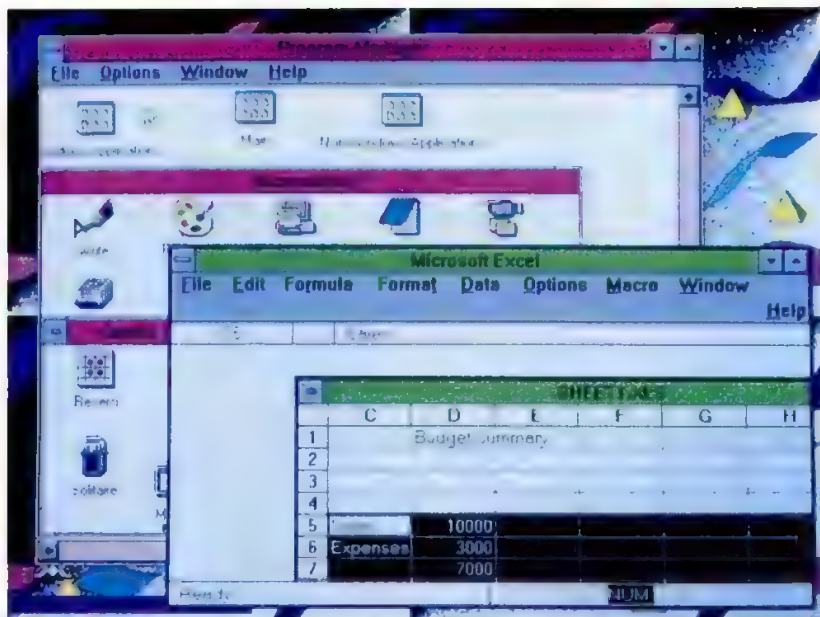
I bet your PC is configured with a KEYB command in AUTOEXEC.BAT or an INSTALL=KEYB directive in CONFIG.SYS. KEYB is a TSR supplied with DOS that replaces the keyboard handler in the BIOS with one that remaps the keyboard for use in countries other than the United States. With KEYB installed, the right Alt key no longer functions as an Alt key, but as a sort of auxiliary Shift key used to enter *dead key combinations*—keystroke sequences that produce characters with acute accents, grave accents, cedillas, and other assorted diacritics. (IBM calls this remapped Alt key *Alt-Gr* in its PC-DOS documentation.) For a full discussion of the KEYB command, please refer to the Tutor column in the May 15, 1990, issue of *PC Magazine*.

If your system is configured with KEYB, you can correct the problem in either of two ways: by removing the command that installs KEYB from your CONFIG.SYS or AUTOEXEC.BAT file and rebooting, or by pressing Ctrl-Alt-F1 to restore normal keyboard operation. With KEYB installed, Ctrl-Alt-F2 activates the foreign keyboard layout specified when KEYB was installed, while Ctrl-Alt-F1 reactivates the U.S. keyboard layout.

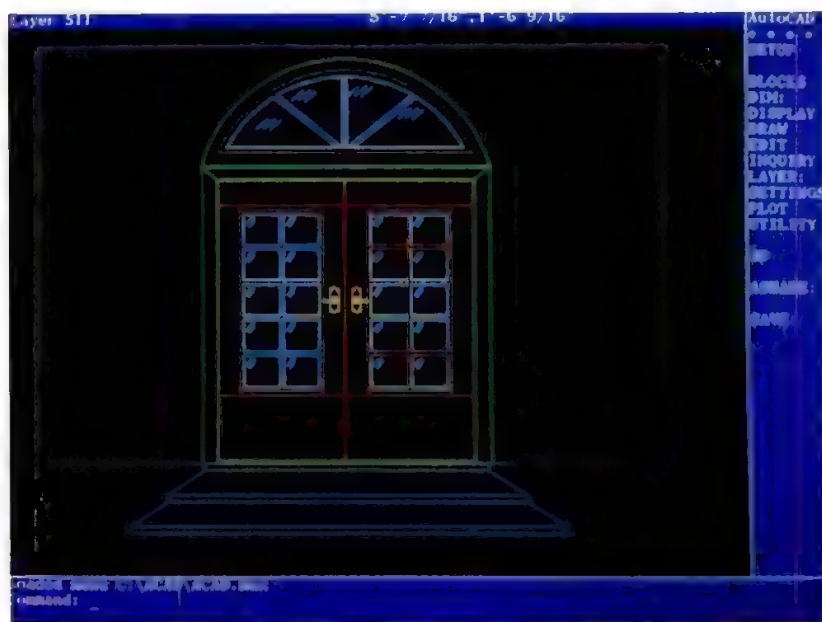
ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. To have your question answered, write to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see the PC MagNet News page, immediately following the Utilities column, for access instructions). We're sorry, but we're unable to answer questions individually. ■

Why Cleaner Screens Brighten Windows. (And Doors)



CM-1440: A Trinitron® tube and our enhanced technology makes Windows and all business applications cleaner, brighter, and sharper.



CM-1450: Non-interlaced 1024x768 resolution makes CAD, DTP, and business graphics brighter without flicker or ghosting. For under \$1000.

In a word, focus. The bright, clean images on our CM-1440 and CM-1450 high-resolution screens come from the best Trinitron tubes, made even better by Seiko Instruments' precision electronics.

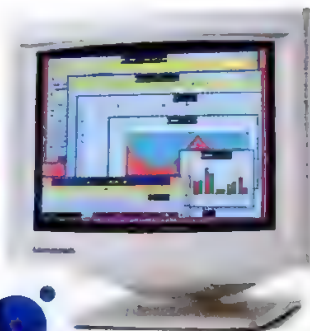
You see, other monitors' electron guns sometimes misalign, resulting in fuzzy, less intense color dots and slightly out of focus type. Our specially designed driving and focusing electronics are simply more precise. So our colors are always on target. And always in focus.

The result is brighter, richer color. Sharper lines. And crisper type. All of which works wonders for Windows, or any application.

Choose the CM-1440 for the sharpest images in business. Or for even crisper, flicker and ghost-free desktop publishing, graphics and CAD, pick the non-interlaced CM-1450. Both have a .25mm aperture grille (dot pitch) to sharpen the details. Of everything from Windows to doors.

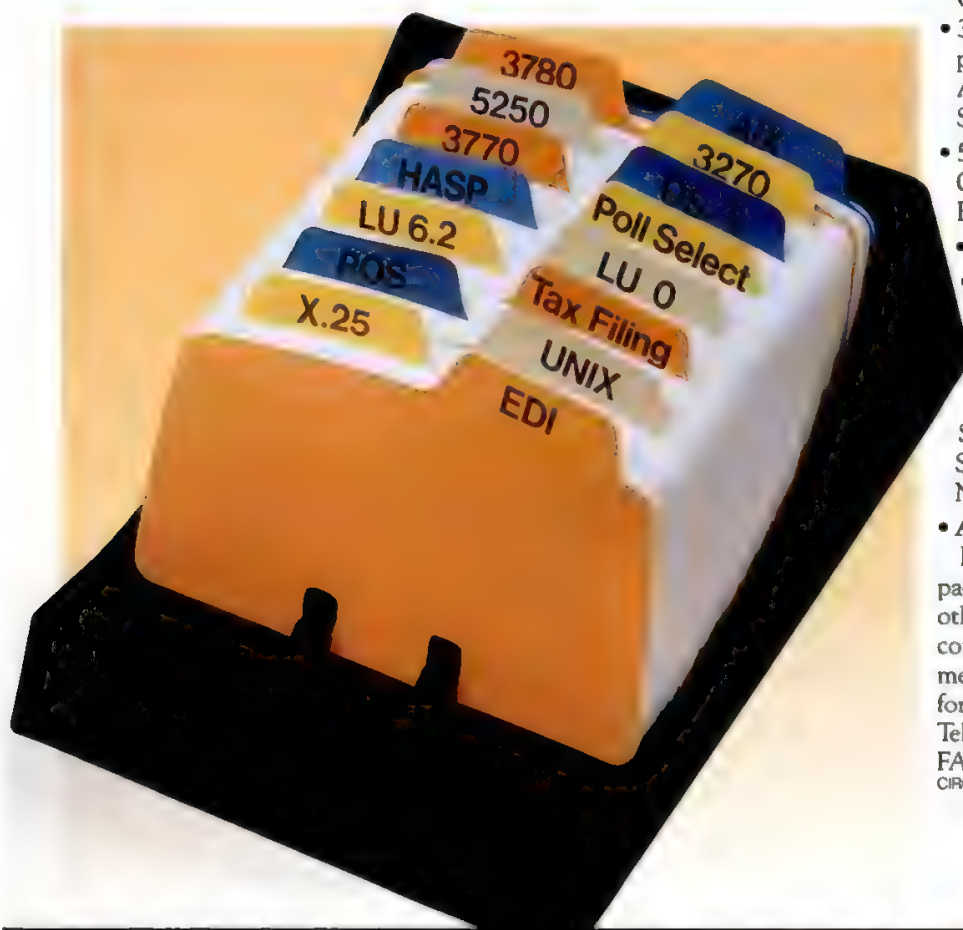
Call 1-800-888-0817 Ext. 112C for dealer information and a free brochure on our entire line of precision engineered, 14" and 20" monitors for PC's and MACs.*

Model	8514/A		1024x768 Int*	1024x768 Non-Int*	640x480 MAC	1024x768 MAC
	640x480 VGA	800x600 SVGA				
CM-1440 14"	X	X	X			
CM-1450 14"	X	X	X	X		
CM-2050 20"	X	X	X	X	X	X
CM-1445 14"					X	



SII 
Seiko Instruments

UDS puts Sync-Up modem software support at your fingertips



Superior software support is one of the many reasons why Sync-Up™ emulator/modems, by UDS, have become the industry-wide choice for remote micro-to-mainframe, micro-to-mini and micro-to-micro communication solutions.

Leading software publishers, writing for today's (and tomorrow's) most popular applications — that's the combination that has brought Sync-Up to the forefront of remote PC communications. Consider these applications, and the software houses that support them:

- **TAX FILING**—CPAid; Nelco; Tax\$imple; Teletax
- **EDI**—Scheme Software Corp.; Edwin Systems; CTI; Fortell
- **REMOTE ACCESS**—Triton Technologies; NSA; SoftKlone; CRG (Blast)
- **3270 EMULATION**—CQ Computer Communications; NSA; Attachmate; Black Box; Sterling Software
- **5250 EMULATION**—CQ Computer Communications; Black Box; Emerald
- **X.25**—Microdyne; NSA
- **UNIX, XENIX, AIX**—The Santa Cruz Operation; Cleo; Serengeti Software
- **REMOTE JOB ENTRY**—CQ Computer Communications; Serengeti Software; Eastham Assoc.; Sterling Software; Barr Systems; NSA; Black Box; Cleo
- **APPC/LU6.2**—NSA

For information about specific packages available from these and other outstanding software suppliers, consult our Sync-Up product management team. Contact UDS, 5000 Bradford Drive, Huntsville, AL 35805-1993. Telephone 205/430-8000; FAX 205/430-8926.

CIRCLE 367 ON READER SERVICE CARD



by
Frank J. Derfler, Jr.

Connectivity

A NETBIOS REFERENCE

I want to port a program written in Turbo Pascal to a NetBIOS-compatible network, but I need a good technical reference, one that explains the ins and outs of NetBIOS, including the NetBIOS calls. I haven't been able to find such a book in the Netherlands. Can you help?

Ferdi Engels
Utrecht, Netherlands



Architecture Technology Corp. sells a book called *Inside NetBIOS* for \$49.95 (\$59.95 outside the U.S.). The book is in its second edition, and it's an excellent guide for would-be NetBIOS programmers. For more information, contact Architecture Technology Corp., P.O. Box 24344, Minneapolis, MN 55424.

A LAPTOP FILE SERVER

Here's a suggestion to make installing *NetWare* file servers easier when you're on the road. Set up a laptop as a nondedicated *NetWare* file server before you leave your office. Then you can easily generate additional file servers at client sites without having to shuffle all those floppy disks. Just put a network adapter in the file-server-to-be, login to the laptop, and generate the new file server from your portable file server.

There's one possible problem that you may run into: When you set up the laptop file server, *NetWare* must begin on track 0 (the first partition) of the hard disk. But if you want to boot DOS, it must also reside in the first partition. Since *NetWare* is very large, you might not have enough room in the normal 32MB partitions for both. The solution? Set up a partition larger than 32MB using a version of DOS (such as Compaq DOS 3.31 or IBM DOS 4.01) that allows you to do this. Then you can make the *NetWare* partition on your laptop hard disk as large as you need and use the rest for DOS.

Charles Taylor
Chicago, Illinois

■ **A NETBIOS REFERENCE:** Here's an excellent guide for NetBIOS programmers.

■ **A LAPTOP FILE SERVER:** Here's a tip for network installers on the go.

■ **UNINTERRUPTED POWER:** Maintaining reliable power to your system will be more critical in the future—and more difficult.

■ **LINKING LAN OPERATING SYSTEMS:** How PCs can access more than one network operating system.



The thought is good, but you forgot to mention that you'll have to go through that floppy shuffle at least once in the office to prepare the properly serial-numbered version of *NetWare* for installation on the server. Also, you must make sure you've got the right versions of every file. One little discrepancy, such as a change from Version 2.15b to Version 2.15c, can make the difference between successful and unsuccessful installation.

As for booting DOS, why not just boot the laptop from a floppy disk in the A: drive?

UNINTERRUPTED POWER

As the founder of the Uninterruptible Up-time Users Group, I read your November 27, 1990, review of uninterruptible power supplies with great interest. You provided a real service by showing the capabilities built into the PC's power supply and your results clearly demonstrate the march of

technology. Earlier generations of computer power supplies could not have withstood such abuse from the power line.

At our group meetings, we've had several speakers discuss trends in power quality and continuity, and the conclusions are disconcerting. It seems likely that by 1995 all sections of the country will have less than the 17% reserve capacity recommended for reliable electrical power. People who rely on computers for their businesses will increasingly need to bolster their computers with a UPS.

There are three areas I'd like to see investigated as a follow-up to your evaluation:

■ Batteries are the weak link in UPS performance, and there is currently no way to predict whether a battery will deliver power during an emergency. Batteries may sit and wait for months or even years and then fail when they are needed most.

■ Since you clearly established that switching times are largely irrelevant in deciding between on-line or off-line UPS systems, your next round of experiments should address whether either of the two types offers any difference in the protection of equipment from transients (rapid fluctuations of voltage in a power line). I don't think it is sufficient to assume that a UPS will protect against transients because it has UL approval. The UL surge test only proves that products are safe.

■ You might explore the advantages and disadvantages of providing a UPS for every desk versus using a centralized system. This is an issue every large organization will confront sooner rather than later.

Thanks again for your review.
Kenneth G. Brill
New York, New York



This letter is one of several I received in response to our UPS review. Some of the letters included pages of correspondence between the managers of large organizations and

UPS companies. The letters concerned battery cracks, leaks, and failures. It's clear that the batteries in UPS systems present a serious problem for even the most savvy and experienced technicians. Many people blindly put their faith in UPS batteries that might fail when needed most.

One user at the medical facility of a major university acknowledged the efforts of his local dealer and the manufacturer to replace batteries in the many UPS systems they use, but spoke of his lack of trust in the systems. He said, "A warranty on the battery in your UPS is like a warranty on your parachute: You often can collect only after it's too late."

In the PC Magazine LAN Labs, we've begun to do monthly checks of the batteries in our UPS systems. We're simply going to pull the plug and let the batteries run down under a load. This is not a recommended procedure for operational systems, because the deep discharge and recharge puts great stress on the battery, but we should develop some interesting data that we'll report in later issues. We'll do other longitudinal tests, as well.

We also received many letters challenging us to do surge and transient tests. It appears that aging has a lot to do with the effectiveness of surge suppressors. The devices that pass our surge suppression tests when they are new may well lose their ability to protect after some period of service. We're hoping to collect a variety of old and new devices for testing. We also have engineers looking into some of the conflicting claims about surge suppression that are energetically defended by different interests.

In contrast, the study of centralized site protection versus protection for every desktop seems almost simple, though the right solution does depend a great deal on specific elements of the installation as well as company policy. One user asked for a "protocol to follow for a power review of a facility." We'll certainly be able to provide you with a good checklist in the future.

We intend to cover some of these topics in upcoming issues, and I'd really appreciate hearing from people with informed opinions.

Members of the Uninterruptible Uptime Users Group include a number of

high-powered companies in New York City. For more information, write UUUG, P. O. Box 3743, Church Street Station, New York, NY 10008.

LINKING LAN OPERATING SYSTEMS

Am I correct in assuming that two Sun workstations running Sun Microsystems' *Network File System (PC-NFS)* over thin Ethernet can share the cable with a Novell network?

If so, can a workstation on the Novell network reboot and install an NFS driver to communicate with the Sun computers and retrieve files from the Sun server?

Karl Mormer
(via CompuServe)



The answer to both of your questions is yes. If the PCs on the LAN have network interface adapters compatible with both *NetWare* and *PC-NFS* (for example, the Western Digital 8003), then the users can simply reboot and load *PC-NFS* to get full communications with, and services from, the Sun workstations.

This is an excellent application for a remote-boot ROM, even in workstations that have disk drives. When you install one of these ROMs in a LAN adapter in a PC with a disk drive, the question "Boot from Network?" appears on the screen each time the PC begins a boot cycle. If the user answers Y, the PC takes its boot image, including *CONFIG.SYS*, *AUTOEXEC.BAT*, and other *.SYS* files, from a special disk image file the system manager created on the server. This image can contain all the *NetWare*-specific booting routines.

On the other hand, if the user responds negatively, the PC boots from its own drive where the manager can create an appropriate *AUTOEXEC.BAT* and a *CONFIG.SYS* that installs the *PC-NFS* drivers. This is much neater than the other common alternative, booting from separate floppy disks.

However, there's an even better way that anyone who manages PCs on a multi-user LAN should know. Hughes LAN Systems sells a package called *ProLINC*, which allows a PC to simultaneously access and communicate with servers running *NFS*, *NetWare*, *LAN Manager*, Banyan Systems' *VINES*, server software from Digital Equipment Corp., and (with the delivery of one more module in early 1991) IBM's *PC-LAN* and similar pro-

grams. Each server appears as a separate DOS drive letter to the user.

ProLINC incorporates several features that reduce the normally unacceptable amount of RAM it would take to load all the drivers for all these different server systems at the same time. It minimizes the amount of memory required for the programs in protocol stacks such as Digital's LAT and Novell's IPX, and can also dynamically load and unload the bigger protocol stacks such as TCP/IP and NFS. *ProLINC* works with programs such as Helix Systems' *NetRoom* that move protocols into high, extended, or expanded memory, and it also works with *Microsoft Windows*.

Earlier, I said you could jump between *NetWare* and *PC-NFS* if your PC is equipped with a card that works with both operating systems. But finding a single adapter compatible with two or more specific LAN operating systems can be a real challenge. *ProLINC* does away with the problem of adapter compatibility by running on top of any adapter with a driver meeting Microsoft's Network Device Interface Specification (NDIS). Our experience in the LAN Labs is that practically every company making IEEE 802.5 Token-Ring or IEEE 802.3 Ethernet LAN adapters has NDIS drivers.

On the downside, Hughes puts a rather hefty \$595-per-client-PC price tag on *ProLINC*. A 15-user package sells for \$3,275.

Obviously, there's a lot of development effort involved in creating software that's compatible with so many programs, as well as the continuing problem of tracking the moving target of compatibility, but the price will scare off all but corporate buyers with big budgets and big interoperability problems. This product could solve so many problems in so many organizations that I think Hughes LAN Systems could trade some price for volume. Call them at 415-966-7300.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay \$50 for any tip we print. Please submit your letter on a disk along with a printout. Then mail your contribution to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016, or you may contact Frank J. Derfler, Jr., via MCI Mail (be sure to use Derfler's mail-box named PC MAGAZINE LAN LABS). We regret that we're unable to answer letters individually. ■

TURN TO PAGE 449 AND MEET THE NEXT APPLE, DELL MICROSOFT...

You'll meet some of today's most exciting new companies and their products. Showcased in color. Poised to become tomorrow's household words in the PC industry.

Turn to page 449 and discover PREMIER— in our exciting new and expanded Marketplace section.

PC PREMIER

Advertisers: You can target over 763,398 PC buyers in this high-impact, low-cost section by calling 1-800-825-4237.

PC
PREMIER

The Color
for Laptop
Products

Computer Magazine says "...Arlington offers worry-free mail order purchasing at reasonable rates!"

IBM PERSONAL SYSTEM II

Model 30, 286, 40 MB, w/Monitor	\$1799
Model 55SX, w/60 MB w/Monitor	\$2599
Port. 70/120	\$5695
Model 70, w/60 MB and Monitor	\$2999
Model 70, w/121 MB and Monitor	\$3799
Model 70-A21, w/121 MB and Monitor	\$4999
6 Month Warranty	

COMPAQ 286N

(12MHZ) 40MB, 1MG Memory,
Mono VGA Card & Monitor... **\$1699**

COMPAQ PORTABLES

LTE 20	\$1899
LTE 286 20/40	\$2499/\$2849
SLT 386 S/20-60 MB	\$4749

COMPAQ 386

Model 386S MOD I	\$1799
Model 386S w/40 MB (16 MHZ)	\$2099
Model 386E w/40 MB (20 MHZ)	\$2795
Model 386E w/100 MB	\$2999
Model 386 25E w/100 MB	\$4299
Model 386-33 w/84 MB	\$6999
6 Month Warranty	

PANASONIC COMPUTERS

FX1925 — 386SX, 40 MG, VGA color
monitor **Call**

CF170 Notebook 6.1 lbs., 10 MHZ,
20 MB. **Very Competitive Prices**

CF270 Notebook, 16 MHZ, 20 MG,
VGA .. **Very Competitive Prices**

GOLDSTAR

286, 12 MHZ, 1 MG Memory, 40MG, VGA Monitor	\$999
386SX, 16 MHZ, 1MG, 40MG, VGA Monitor	\$1249
386SX, 20 MHZ, 1MG, 40MG, VGA Monitor	\$1399
386 Tower, 33 MHZ, 4 MG Memory	\$2499
Laptop - 386SX, 40 MG, VGA	\$1999

MODEMS

Hayes 1200/2400 Ext	\$279/329
V-Series 9600 Int.	\$549
Intel 2400	\$139
Intel 2400 Ext.	\$159
Intel 9600	\$479
Megahertz 2400 Toshiba	\$139
2400 Cpq LTE	\$139
Everex 2400	\$89
Everex 2400 External	\$169
US Robotics 9600	\$579

CHIPS

256K/1 MG Chips . each	\$4/\$7
256K/1MB Simms	\$30/\$59
Compaq 386 1 MB	\$149
Compaq 386 4 MB	\$349
Compaq 386 2 MB-33	\$179
Compaq SLT 2 MB	\$249
Compaq LTE 2MB	\$199
Compaq Port 2MB	\$275
IBM 2-8 MG Board	\$379
IBM 30-286 512K	\$79
IBM 70 & 80 2 MB	\$159
Toshiba Port 2MB	\$175

intel

Intel 8087-3	\$99
Intel 8087-2	\$119
80287-10XL	\$189
80387-16/80387-SX	\$319/\$289
80387 SX-20	\$299
80387-20	\$359
80387-25/80387-33	\$439/\$499

MULTIFUNCTION BOARDS

AST 6 Pack w/384K	\$169
AST 6 Pack 286	\$189
AST Rampage Plus	\$339
AST Rampage Plus 2 MG	\$449
Irma Board III	\$409
AST 5251-II Plus	\$479

INTEL

Intel Above Board+	\$329
Intel Plus 8 w/2 MG	\$479
Intel 386 PC w/1 MG	\$469
Intel Satisfaction	\$379

SCAN. & DIGIT.

Panasonic FXRS 3070U	\$949
Summasketch 12x12	\$319
Summasketch 12x18	\$539
Sharp FO-333 Fax	\$749

DRIVES & TAPES

Ext. 5 1/4" for PSII	\$159
Ext. 1 2 for PSII	\$179
Toshiba 3 1/2" 720K	\$69
Toshiba 3 1/2" 1.44	\$79
Colorado Jumbo 40	\$259
Everex 40 MB Tape	\$239
Everex 60 MB Tape	\$599

SEAGATE HARD DISKS

20 MB for XT (ST225)	\$239
30 MB for XT (ST238)	\$259
48 MB 3 1/2" (157N-Kit)	\$299
40 MB (157A)	\$239
40 MB for AT (ST251-1)	\$249
80 MB for AT (4096)	\$549
80 MG 296 Kit	\$379
111 MB 1126A	\$629

IOMEGA

20 MB Int. w/boot card	\$999
44 MB Int. w/boot card	\$1125

PLUS

Hard Card 20 MB	\$489
Hard Card 40 MB	\$549
Hard Card 80 MB	\$579
Hard Card 105 MB	\$679

CONNOR HARD DRIVES

40 MB	\$259
100 MB/200MB	\$459/\$799

PRINTERS

EPSON

VERY COMPETITIVE PRICES!!

LX810 ...	\$173	LQ860 ..	\$549
FX850 ...	\$289	LQ1010 .	\$369
FX1050 ..	\$399	LQ1050 ..	\$569
LQ200 ..	\$239	LQ2550 ..	\$849
LQ510 ..	\$249	EPL 7000	\$799
LQ850 ..	\$435	EPL7500	\$1999
ES-300C...\$1199			

OKIDATA

ML320	\$319	ML393	\$929
ML321	\$439	OLC 400	\$629
ML380	\$289	OLC 820	\$1249
ML390	\$439	OLC 840	\$1899
ML391	\$599	OLC 800	\$949

CITIZEN

120D	\$129	HSP500	\$309
GSX140	\$299	HSP550	\$429

PANASONIC

GREAT PRICES!!!

1123	\$229	1654	\$519
1124	\$259	1695	\$389
1180	\$149	4420	\$779
1191	\$219	4450I ..	\$1199
1624	\$359	4455	\$1999
4420/4450I 2MG Memory \$199			

HEWLETT-PACKARD

Laserjet III w/Toner	\$1579
Laserjet IIP w/Toner	\$869
Deskjet Plus 500	\$529
Laserjet IIID	\$2649
Pacific Data 1MG	\$129
Pacific Data 2MG	\$159
Pacific Data 4MG	\$299
Pacific Page	\$329
Pacific CFL	\$259
Plotter-in-Cartridge	\$229
Pacific Data 25 in 1 Font	\$249

NETWORKING

Advanced Network 2.15	\$1899
SFT Network 2.15	\$2799
ELS Level I 4 User	\$489
ELS Level II 8 User	\$1199
NE1000 Ethernet	\$179
NE2000	\$189
Ethercard +/-16	\$149/\$189

SOFTWARE

D Base III Plus	\$419
D Base IV	\$479
Harvard Graphics	\$289
IBM Displaywrite V	\$239
Logitech Mouse	\$69
Lotus 123 2.2/3.1	\$329/\$389
Microsoft Mouse	\$99
Microsoft Excel	\$299
Microsoft Windows 3.0	\$99
Microsoft Word	\$219
Multimate Version IV	\$239
R Base for DOS	\$439
Symphony	\$459
Ventura Desktop Publ.	\$519
Word Perfect 5.1	\$249

VIDEO BOARDS

ATI 16 Basic	\$89
ATI VGA Wonder	\$199
ATI VGA Wonder 512	\$229
Goldstar VGA	\$79
Genoa 6300/6400	\$189/\$239
NEC Grph Engine 256	\$899
Orchid Pro w/512K	\$289
Paradise VGA	\$139
Paradise +16	\$179
Paradise VGA 1024	\$189
STB Power IMG	\$249

MONITORS

MITSUBISHI

EGA	\$339
Diamond Scan	\$489
HL6605 16"	\$1049
HL6905 20"	\$1799
3950 ADK	\$1649

NEC

Multisync IIA	\$469
Multisync IIID	\$599
Multisync IVD	\$979
Multisync VD	\$2275

PANASONIC

1381 VGA 1024x768	\$379
1391 VGA 1024x768	\$499

GOLDSTAR

Color/EGA	\$199/\$269
VGA 1425+	\$279
VGA 1430	\$299

CIRCLE 336 ON READER SERVICE CARD

**Arlington
Computer
Products, inc.**

Defective software will be replaced with
the same item only. We cannot guarantee
performance. Returned shipments are
subject to a resending fee. Prices and
availability subject to change without
notice.

1970 CARBOY
MT. PROSPECT, IL 60056

FOR ORDERS & SYSTEMS INQUIRY



800-548-5105

CUSTOMER SERVICE AND IN ILLINOIS 708-228-6333

SHIPPING 708-228-9748

TECHNICAL ASSISTANCE 708-228-1470

FAX 708-228-0516

No surcharge for MasterCard or Visa.

PC

MAGAZINE

EDITORS' CHOICE

June 27, 1989
Mass Storage Mail Order

HARD DRIVES



Maxtor

80Mb

MX7080A

Bare Drive **\$399**

IDE-17ms Kit **\$439**



Performance Kits

CONNER

40Mb 25ms **\$279**

CP3000

80Mb 25ms **\$479**

CP3184

104Mb 25ms **\$529**

CP3104

209Mb 16ms **\$899**

CP3204

YOU GET - 16 bit Hard/Floppy controller • IDE interface, embedded PC/AT controller • Disk Manager formatting software • "1 to 1" Interleave • 32K or 64K "Look Ahead" read buffer • 50G's non-operating shock • Dual Cables • Mounting frame • Grey and Black Bezels

MICROPOLIS

High Capacity Drives ESDI or SCSI PC PAKS Each PC PAK comes COMPLETE with ESDI Controller for dual floppy/dual hard drives. All kits include cables, mounting hardware, installation software and our comprehensive Installation Manual. Network drivers available. SCSI versions are available at equivalent prices.

160Mb Complete Kit
MC1654 16ms HH **\$979**

340Mb Complete Kit
MC1664 14ms HH **\$1495**

660Mb Complete Kit
MC1568 16ms FH **\$1995**

1 Gigabyte Complete Kit
MC1598 14ms FH **\$2895**

KALOK

PC/XT Kits

20Mb \$189
KL320 40ms

30Mb \$219
KL330 40ms

40Mb \$249

KL343 28ms IDE-8 or 16 bit hard/floppy controller with adaptor

Each kit includes drive, cables, controller, How-To manual and mounting hardware.

Seagate

40Mb 28ms • MFM

\$239

ST251-1

All bare drives

80Mb

ST296N **\$329**

28ms SCSI

IMPRIMIS

65Mb 28ms • RLL

\$259

ST277R-1

65Mb

ML134FA RLL • 22ms 3 1/2" • HH

Bare Drive **\$319**

IBM PC/XT KIT **\$369**

IBM AT KIT **\$399**

Kits include controller, cables, mounting hardware, partitioning/formatting software, and installation manuals.

TOSHIBA

104Mb MK234FC

IDE • 22ms 5 1/4" • FH

\$499 IBM 16 bit KIT

Includes 16 bit host adaptor, beige & black bezels, rails, cables, software & manual.

Worry-Free 30 Day Guarantee

HARD DRIVES ARE OUR BUSINESS!

WE CAN MEET ALL OF YOUR STORAGE NEEDS-CALL TODAY!

UNLIMITED TOLL-FREE TECHNICAL SUPPORT

Card Drive™

Card Drive 20 KL320 40ms **\$239**

Card Drive 30 KL330 40ms **\$259**

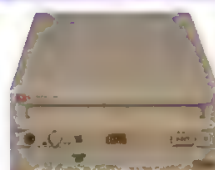
Card Drive 50 ST157R 28ms **\$339**

Card Drive 65 MK134 22ms **\$399**

Card Drives use quality Kalok, Miniscribe, Seagate or Toshiba hard drives, with controller and cables mounted onto a sturdy metal frame. Pre-tested and pre-formatted, Card Drives are available for IBM PC/XT, compatibles and most Tandy models.

SUPER EASY INSTALLATION!

CD ROM/OPTICAL



• CD ROM • WORM
• REWRITABLE
• JUKEBOXES

You name it, we have it, can ship it, and support it!

CHINON
TOSHIBA
PACKARD BELL

Internal External

\$449 \$599

\$629 \$749

N/A \$599

YOUR OPTICAL EXPERTS: EVERYTHING YOU NEED!

TAPE BACKUP

COLORADO

60Mb / 120Mb With data compression **\$249**

FLOPPY DRIVES

360K	\$54	\$59	Complete with Installation Kit!
720K	\$59	\$64	
1.2Mb	\$69	\$74	
1.44Mb	\$69	\$74	

HARD DRIVES International

Insight
Another
Insight
Company

1912 West Fourth St.
Dept. JA
Tempe, AZ 85281
Sales: (602) 350-1128



U.S. and Canada
(800) 767-DISC

Order Status: (800) 729-4490 FAX: (602) 829-9193

Corp. • Gov't. • Institutional
PURCHASE ORDERS Sales: (800) 733-0882 FAX: (602) 350-1180

APC/FPO
(602) 350-1145

International

Sales: (602) 350-1144 FAX: (602) 921-8312

All orders shipped via



Come visit our retail outlet in AZ!

Never a charge for Visa or MC!



Prices and availability subject to change without notice. All items are NEW. P.O.s accepted from qualified buyers. Net 30. Some conditions may apply. Add \$13 shipping for EXPRESS APC/FPO orders. 30 Day Guarantee: shipping & handling charge is non-refundable; product must be undamaged and in original condition. 1 Year Replacement Policy may have some restrictions. Hard Drives International is a division of Insight Distribution Network, Inc. All trademarks are the properties of their respective owners. 3/9/89

FastData 386 Systems



FastData 386/33 \$2399

The fastest 386 processor available combined with a 64K thirty nanosecond memory cache make the FastData 386/33 a power users dream! Included in the base price is a 100 megabyte 20 millisecond hard disk, 1024 by 768 VGA monitor and card, four megabytes of memory, and 5.25" & 3.5" high capacity floppy drives. Plus, should anything ever go wrong with your FastData computer, you are covered by a one-year warranty with free on-site service or system replacement if we cannot correct the problem with our FastSHIP advance parts replacement program.

Standard Features

- ✓ 33mhz Intel 386-DX processor.
- ✓ 64K high-speed memory cache.
- ✓ 4 megabytes RAM.
- ✓ 100 mb 20ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Full size (shown) chassis with keylock, speed and reset buttons.
- ✓ 387-DX coprocessor socket.
- ✓ 230 watt power supply
- ✓ 14" Super VGA color monitor, 1024x768 resolution, with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, game port and two serial ports.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots & 5 drive bays.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$99.
- ✓ FCC Class B approved.

System Price	65mb	80mb	100mb	200mb
Monochrome	\$1,799	\$1,929	\$1,999	\$2,499
VGA Color	\$2,099	\$2,229	\$2,299	\$2,599
VGA 1024	\$2,199	\$2,329	\$2,399	\$2,699



FastData 386/25 \$1999

The optimum combination of features, expandability, and power make the FastData 386/25 an ideal choice for those whose applications demand high speed 32 bit processing and expandability. The value of the 386/25 goes far beyond its price; it comes configured with a full four megabytes of fast RAM, a quick 22 millisecond 65 megabyte hard disk, and maximum VGA displaying 1024 by 768 resolution powered by a high-output 16 bit 512K VGA board. Also, the FastMicro team will configure your FastData 386 exactly the way you want, without sending you shopping elsewhere.

Standard Features

- ✓ 25mhz Intel 80386-DX.
- ✓ 4 megabytes of zero wait-state RAM.
- ✓ 65 mb 22ms RLL hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive. (For both add \$69)
- ✓ Standard chassis (shown on left) with keylock, speed and reset buttons.
- ✓ 80387-DX coprocessor socket.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor, 1024x768 resolution, with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and game port.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots & 5 drive bays.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$99.
- ✓ Guaranteed compatible.
- ✓ FCC Class B approved.

System Price	65mb	80mb	100mb	200mb
Monochrome	\$1,599	\$1,729	\$1,799	\$2,099
VGA Color	\$1,899	\$2,029	\$2,099	\$2,399
VGA 1024	\$1,999	\$2,129	\$2,199	\$2,499



FastData 486/25

Call about our hot new 486, just \$3,199 with the same standard features as our 386-33 system. Includes a 128K two-stage cache and is expandable to 64mb of memory.

All FastData Systems Include:

- 30 day money-back guarantee
- Toll-free technical support for life
- One year warranty with on-site service available to most U.S. locations

FastData SX Systems



\$1599 FastData SX/20

25% faster than a 16mhz SX, the FastData SX/20 adds even greater performance to its 386 multitasking capabilities. Just \$200 more than our SX/16, this machine also includes a second floppy drive in addition to the standard VGA color monitor and 16 bit VGA adaptor, Keytronics keyboard and 40 megabyte hard drive. The system includes two megabytes of memory and is expandable to eight on the main system board. Remember, when you have questions, need to solve a problem, or want recommendations on products for your system, the FastMicro team is standing by toll-free to provide product support for as long as you own your FastData personal computer.

Standard Features

- ✓ 20mhz Intel 80386-SX processor.
- ✓ 2 megabytes of zero wait-state RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis (shown) with keylock, speed and reset buttons.
- ✓ 200 watt power supply
- ✓ 14" VGA color monitor with 16 bit VGA card with 256K.
- ✓ Clock calendar, parallel port, two serial ports, and game port.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$99.
- ✓ Guaranteed compatible.
- ✓ FCC Class B approved.

System Price	40mb	65mb	80mb	100mb
Monochrome	\$1,299	\$1,369	\$1,499	\$1,569
VGA Color	\$1,599	\$1,669	\$1,799	\$1,869
VGA 1024	\$1,699	\$1,769	\$1,899	\$1,969



\$1399 FastData 386/SX

Combine the benefits of an advanced Intel 386 processor, the value of a 286 and the advantages of FastData and you've got the FastData 386/SX! This machine is the choice of those who want to run today's powerful 386 and multitasking software, like Windows, and also want to run their favorite DOS applications at surprising speeds. We've made our customers' favorite options standard: it comes with an ample two megabytes of memory, a high performance 40mb hard drive, and 16 bit color VGA. Compare performance, features, and service and you will find no better SX value. Interested further? Try the FastData 386/SX for 30 days; you have to be happy - if not, we'll take it back.

Standard Features

- ✓ 16mhz Intel 80386-SX processor.
- ✓ 2 megabytes of zero wait-state RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive. Both drives add \$69.
- ✓ Standard chassis with keylock, speed and reset buttons (mini desktop shown - add \$50).
- ✓ 200 watt power supply
- ✓ 14" VGA color monitor with 16 bit VGA card with 256K.
- ✓ Clock calendar, parallel port, two serial ports, and a game port.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$99.
- ✓ Guaranteed compatible.
- ✓ FCC Class B approved.

System Price	40mb	65mb	80mb	100mb
Monochrome	\$1,099	\$1,169	\$1,299	\$1,369
VGA Color	\$1,399	\$1,469	\$1,599	\$1,669
VGA 1024	\$1,499	\$1,569	\$1,699	\$1,769

FASTMICRO

For information or to order call:

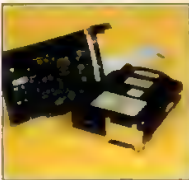
1-800-441-FAST

CIRCLE 352 ON READER SERVICE CARD

Hardware

DISK DRIVES

Colorado DJ-10 40-120mb Int. Tape	249
DJ-20 80-240mb Int. Tape	319
Conner (see IDE controllers below)	
CP3044 40mb IDE 28ms	269
CP3104 100mb IDE 25ms	499
CP3208 200mb IDE 25ms	849



Seagate 89mb AT Kit
\$399 IDE performance, big 89 megabyte capacity and Seagate quality make this kit a great buy. A 19ms access time and 5 mbps transfer rate assure great performance. Controller, cables and rails are included to make installation fast and easy.

Micropolis	
MC1864 340mb ESDI 14ms	1295
MC1598 1.2gb SCSI 14ms	2895
NEC CDR-3501 Ext. CD-ROM w/interface	549
Plus Development	
HardCard IXL 50 - 52mb 9 ms 16bit	399
HardCard IXL 105 - 105mb 9 ms 16bit	679
Impulse 42mb 12 ms 16bit IDE Kit	399
Impulse 105mb 9 ms 16bit IDE Kit	599

Toshiba 1.44mb Floppy Drive

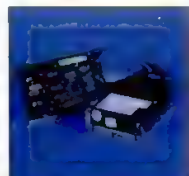
Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 386 compatibles. Will also read/write/format 720K 3.5 disks. Rails, add \$5



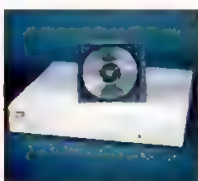
Seagate	
30MB XT Kit ST238 w/ cont	249
40MB AT ST251-1 MFM Drive	239
40MB AT ST157A 28ms IDE Drive	199
80MB AT ST296N SCSI Drive w/adaptor	349
89MB ST1102A 19ms IDE Drive	359
125MB ST1144A 19ms IDE Drive	469
210MB ST1239A 15ms IDE Drive	799
330MB ST2383E 16ms ESDI Drive	1289
Teac	
1.2MB 5.25" Floppy	65
1.44MB 3.5" Floppy	65

Toshiba 100mb IDE Kit

Upgrade your 286 or 386 to IDE technology and Toshiba quality at a FastData price. This kit comes with a fast 20ms 105mb drive and built-in 1:1 controller. 16 bit IDE card with dual floppy controller and cables, 5.25 brackets and rails. Call our experts for all your drive needs. Model MK24HC



Toshiba	
360K 5.25" Floppy (Black)	69
1.2MB 5.25" Floppy	69
1.44MB 3.5" Floppy	69
65mb MK134 22ms RLL drive	279
100mb MK234FC IDE 3.5" drive	449
Western Digital	
WD 16 bit IDE Host - with dual floppy controller	39
WD93044 40mb IDE 28ms	199
WDAC280 80mb IDE 28ms	339
WE1007V-SE2 ESDI AT 1:1 dual controller	149



Sun Moon Star CD-ROM Drive
\$549 Affordable CD-ROM technology is here! This player reads over 1000mb from just one CD and can even play your favorite audio CDs. Using a high quality Hitachi mechanism, it comes with a cable interface and 18 month warranty. Add an Illustrated Encyclopedia CD for \$49

BOARDS

Artisoft/Lantastic	
Lantastic 2mbps Starter Kit - Two Station	369
Lantastic 2mbps Adaptor	169
Lantastic Ethernet Starter Kit - Two Station	499
Lantastic Ethernet Adaptor	239



ATI VGA Wonder+ \$189

New and improved, the ATI VGA WUNDER+ is faster than VRAM. It does interlaced and non-interlaced 1024x768 modes, is 100% register compatible, and comes with extensive software drivers. A free mouse is included as an added bonus. \$12K version \$219

ATI	
2400 ETC Internal	Call
2400 ETC External	187
9600/E External MNP V 42bis	479
VGA Basic 16	75
VGA Wonder+ 256K	189
VGA Wonder+ 512K	229
Brown Wagh Sound Blaster	149
Everex	
2400B Int Modem	99
EGA 480 Card	69
RAM3000 16 bit RAM card	75
RAM8000 16 bit RAM card	169
Hayes	
JT FAX 4800B Internal	139
Personal Modem 2400 w/Prodigy	119
Hercules Graphic Card +	169
Intel	
Classic 2400 Modem Int./Ext	137/167
Satisfaction Classic - Internal 9600	379
8087-2	115
287XL	115
387-DX25	479
387-SX16/20	319/349
Logitech	
ScanMan Plus	165
Scanman 256	299
Orchid	
ProDesigner II 512/1mb	279/329
Tiny Turbo 286	207
Tiny Turbo Xtra	267

Paradise Modem \$449

This external modem features V 42 and MNP error correction combined with MNP/5 and V 42 bis data compression to provide total high speed throughput. The PM9600SA is also V 42 1C M, V 42, V 22 compliant and comes with a five year guarantee



Paradise	
Basic VGA - 8 bit	109
VGA 1024 256K/512K	175/199
Practical Peripherals	
2400B Int Modem	125
2400B Int with MNP	169
PM9600SA Ext. V 32/V 42bis	449
Prometheus	
Promodem 2400B Internal	98
Promodem 2400G External	149
USRobotics	
2400 Sportster Int/Ext	119/147
2400 Sportster Int/Ext	159/199
Courier HST 14,400 Int Ext	539/579
Courier HST 14,400 Dual Standard Ext	859
Video 7	
VGA 1024i 256K	179
VGA 1024i 512K	209
V-RAM VGA 512K	299
ZOOM	
HC2400 Internal	79
2400 V 42bis External Modem	169
9624 Send/Receive Internal Fax Modem	129

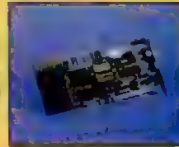
MONITORS

Mitsubishi	
1410 EGA	325
Diamond Scan 1381	479
NEC	
Multisync 2a	469
Multisync GS 2a	199
Multisync 3d	629
Multisync 4d	Call
Panasonic C1381 VGA	439
Princeton	Call
Seiko CM1440/1450	519/659
Sony 1304 Multiscan	669
Zenith 1492	Call

FastData Products

FastData 16 Bit VGA

The FastData 16bit VGA card features 256K of video memory, does CGA, EGA, & VGA up to 1024x768 and comes with drivers for popular software including Windows 3.0. It's expandable to 512K and has a 30 day money-back guarantee.



FastData 16bit 1mb VGA	159
FastData CGA Card	35
FastData MGP Card	29

FastData 2400 Baud Internal Modem

The FastData 2400 baud internal modem is fully Hayes compatible and can be configured to COM port 1-4. It has an internal speaker, is auto answer & auto dial, and comes with BitCom software.



9600B SendFax w/ 2400B Modem	99
MFM 16 Bit 1:1 Hard/Floppy Disk Cont	59
Parallel/Dual Serial/Game Card	29
RLL 16bit 1:1 Hard/Floppy Disk Cont	69
XT 1.44 Dual Floppy Controller	35

FastData Monitors

Your best value, we have a complete line made for us by leading manufacturers like Samsung & Hyundai. Like all FastData products, you have a full 30 day money back guarantee. Shown is the VGA Color for \$279



FastData Monitors	
12" Amber Monochrome	79
14" Amber Monochrome	109
14" White Monochrome	109
14" White VGA Monochrome	129
14" CGA Color .52 dot pitch	199
14" VGA Color .39 dot pitch	269
14" VGA Color .31 dot pitch	319
14" Super VGA 1024 x 768 .28 dp	349

PRINTERS

Canon BJ10E	319
BJ300/BJ330	495/Call

Citizen GSX140

Loaded with features, this 24 pin printer is a best seller. It comes with 6 resident fonts, paper parking, and Epson & IBM printing modes. It does up to 192 CPS and has a unique LCD control panel that lets you set everything without DIP switches. Upgrade to color anytime for just \$39



Citizen	
200GX	189
GSX140 / GSX145	285/395
Fujitsu DL3400	359
NEC	
P3200	269
P3300	369
P6200	469
P6300	629
OKIDATA Okilaser 400	669

NEC Silentwriter 2 Model 90 \$1595

PC Magazine's editor's choice! The new NEC model 90 comes with 2mb of memory, Postscript by Adobe with 35 fonts, and parallel, serial and AppleTalk interfaces. All this and 6 ppm speed, an easy-to-use LCD operator panel and letter, legal, & envelope feed



Panasonic	
KXP1180	155
KXP1123	Call
KXP1624	429
KXP4420 Laser	829
KXP4450/4455 Lasers	Call
Seiko Smart Label Printer	167
Star	
NX1001	149
NX1500	299
NX2410	249
NB2410 2415	429 / 569
Texas Instruments Microlaser PS17	1199
Microlaser PS35	1499

FastData 286/12 \$799

Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a Keytronics keyboard. And since it's a FastData, you are backed with toll free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money back satisfaction guarantee!

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms hard disk 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive (2nd drive add \$69)
- ✓ Standard chassis
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ 287XL coprocessor socket
- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, and two serial ports.
- ✓ Keytronics enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available.
- ✓ Full documentation.
- ✓ FCC Class B approved.



System Price	40mb	65mb	80mb	100mb
Monochrome	\$799	\$899	\$999	\$1099
VGA 1024	\$899	\$999	\$1099	\$1199
VGA 1024	\$999	\$1099	\$1199	\$1299

Software



We Ship Air at
Ground Rates

DATABASE & FORMS

askSam 5.0	209
Avery List & Mail Plus	37
Claron Personal Developer	45
Claron Professional Developer	449
Clipper 5.0	489
DataEase	459



Personal R:Base \$89

Who's says powerful relational databases are expensive. Not with the new easy-to-use Personal R:Base. It has intuitive pull-down menus that let you query your data, build quick forms and reports automatically and even build applications without complex programming.

dBase III+	439
dBase IV	479
dBXL Diamond	129
Formbase	299
FormTool Gold	52
Formfiller	85
Foxbase Plus	177
FoxPro	417
Paradox 3.5	489
PerForm Designer & Filler	95
Personal Rbase	89
Q & A	214
RapidFile	99
Rbase for DOS	447
Reflex	159

DESKTOP PUBLISHING

Adobe Postscript Cart. for HPLJ-II	279
db Publisher Professional	389
GEM Desktop Pub.	159
Pagemaker 4.0	489

Corel Draw Version 2.0 \$359



Winner of all the top awards, Corel Draw gives you more for your money. It runs under Windows & includes incredible drawing and editing tools. Includes over 100 typefaces and 300 pieces of clipart. Corel Trace converts scanned art to smooth vector images in seconds. This is the most complete illustration package we've ever seen!

PFS:First Publisher	89
Printshop	33
Publisher's Paintbrush	149
Printshop III	135
Ventura Publisher Gold / Windows	539

FINANCIAL

ACCPAC BPI Value Pak	359
Bedford Integrated Acct	119
DAC Accounting 4.1	79
DAC Bonus Pack 4.1	119
DAC Payroll 4.1	57
Dollars & Sense	98

Peachtree Complete III \$139

A super value! Includes General Ledger, Accounts Payable, Accounts Receivable, Incoming Purchase Order Payroll Inventory, Job Cost, Fixed Assets and more. Loaded with over 450 reports, automatic backup and helpful manuals.



Macintosh 1040 for Windows	57
Managing Your Money	125
Money Matters	49
One Write Plus G/L, A/P & A/R	165
Peachtree Complete III	139
Peachtree with Data Query	209
Quickcheck	36
Taxview 1040 Prof. for Windows	299
Turbo Tax Personal 1040	39
Turbo Tax Professional	209
Wealth Builder	129

GRAPHICS

Autodesk 3.0	139
Corel Draw 2.0	359
Design CADD 3-D	285
DrawPerfect	165
Freelance Plus	307
Genetic 3D Drafting	199
Genetic Cadd Level 2 Starter Kit	95
Genetic Cadd 5.0	279
Harvard Graphics	299
PC Paintbrush IV Plus	109
Perspective Jr	69
PFS:First Graphics	89



GeoWorks \$115

GeoWorks is the entry level graphical environment that's received rave reviews. It includes GeoWrite word processor & desktop publisher, GeoDraw object-oriented drawing package, and GeoComm communications package. Also comes with GeoManager, GeoPlanner and GeoDev applications. Plus all programs operate with the same point & click simplicity (mouse required).

INTEGRATED

First Choice	95
Framework XE	95
Geoworks Ensemble	115
LotusWorks	89
SmartWare II	417
Symphony 2.2	489
Works	89

MICE/INPUT

Keytronics KB101 Keyboard	59
Keytronics Professional Mouse	59
Logitech Mouseman Serial righthand	65
Logitech Mouseman Serial w/Windows	127
Logitech Mouseman Serial righthand	76



Logitech Mouseman Serial \$65

Logitech's MouseMan is the next step in mouse evolution. Specifically tailored in right or left hand versions, it provides maximum comfort and 400DPI hardware resolution. Includes MouseWare utilities and Lifetime Warranty. Specify right or left for PaintShow, add \$15.

Logitech Mouseman Cordless	129
Logitech Trackman Serial	75
Microsoft Serial or Bus Mouse only	83
Microsoft Serial or Bus w/ paint	95
Microsoft with Windows 3.0	147
Z-Nix Serial Mouse w/Windows 3.0	89

PROGRAMMING

Macro Assembler	89
Microsoft C Compiler	303
Borland C++	129
Turbo Pascal	90
Quick Basic	60
Quick C	60
Quick Pascal	60
Windows Developer's Kit	309

SPREADSHEETS

Allways	115
Excel for Windows	299
Lotus 1-2-3 version 2.2	325
Lotus 1-2-3 version 3.1	399

Excel 3.0 for Windows \$299

The best graphics spreadsheet sheet now includes Toolbars which puts frequently used commands at a single mouse click away. New Q & T lets you access remote databases & BestFit automatically resizes columns to display longer cell widths. 3-D charts, clip art support, and button macros are included too! Command level on screen help for transitional 1-2-3 users is included too.



Lucid 3-D	53
Quattro Pro 2.0 Competitive Upgrade	89
Supercalc 5D	289

WORD PROCESSORS

Facelift for WordPerfect	57
Grammatik IV	49
LetterPerfect	119
Multimate 4.0	267
Professional Write	149
Publisher's PowerPak for WordPerfect	45
Rightwriter	58

WordPerfect 5.1 \$239



WordPerfect is the #1 rated word processing software. It's got almost every feature imaginable and yet it's easy to use. The current version adds pull-down menus, mouse support, table creation and equation editor. Add this to the best software support in the business and you can't go wrong!

Sprint	117
Word	209
Word for Windows	309
Word Perfect 5.1	239
Word Perfect for Windows	Call
Word Perfect Add'l Station	153
Word Perfect Office	79
WordStar Professional	Call
Writer's Toolkit	79

Call On Non-Listed Items

WINDOWS SOFTWARE

Adobe Illustrator	279
Adobe Type Manager	59
Ami	115
Ami Professional	287
Asymetrix Toolbook	279
Bitstream Facelift	57
Corel Draw 2.0	359

Windows 3.0 \$89

Turn your 286 or above with 640K or more of memory into a powerful multitasking workstation that runs even non-Windows applications. Includes many integrated applications standard Plus, if you buy Windows now from FastMicro, we'll throw in 10 of the best Windows shareware programs.

DBfast/Windows	239
Excel	309
Form Publisher	139
Grammatik IV for Windows	49
HDC First Apps or Windows Express	46
Micrographix Draw +	149
Micrographix Designer	449
MicroPhone II	199
Microsoft Mouse w/ Windows 3.0	147
Microsoft Office (Word/Excel/Powerpoint)	619
Microsoft Productivity Pack	39
Microsoft Windows Developer's Kit	309
Pagemaker 4.0	489
PerForm Pro	289
Powerpoint for Windows	309
Project for Windows	429
Publisher's Powerpak for Windows	45
Windows 3.0	89
Windows Entertainment Pack	27
WingZ Spreadsheet	309
Word for Windows	299

Adobe Type Manager & Type Align \$109 for both

Adobe Type Manager for Windows brings scalable PostScript fonts to your screen and non-PostScript dot matrix or laser printer. Includes Times, Helvetica, Courier and Symbol font families. New Adobe TypeAlign for Windows works with ATM to create curved, skewed and other special type effects which you can import into other Windows applications.



ENTERTAINMENT & EDUCATION

Bannermania	21
Carmen SanDiego Deluxe Edition	45
F-19 Stealth Fighter	38
Hunt for Red October	19
King's Quest 5 (VGA Vers.)	38
Leisure Suit Larry II or III	35
Microsoft Flight Simulator	38
Aircraft & Scenery Designer	27
Microsoft Learning DOS	32
NFL Challenge	55
PC Globe or PC USA	35
Simcity	28
Tetris	19

Utility Software

Address Book Plus	45
Calendar Creator Plus	39
Central Point Backup	59
Company Ladder	45
Control Room	69
CoreFast	60
Carbon Copy Plus w/Host	105



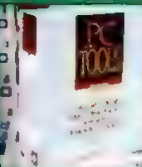
DR DOS 5.0 \$129

DR DOS 5.0 makes more than 620K DOS memory available on 08x systems. Includes ViewMAX graphical interface. Other advanced DOS functions include password file protection, on-line hard disk checking, file linking, file transfer utilities, command line history, EMM386 support and more. DR DOS 5.0 provides full DOS application compatibility and can be easily installed without reformatting.

Desqview	75
Desqview 386	125
Direct Access	57
Disk Optimizer	37
DR DOS 5.0	129
GoScript Select/Plus	59/179

Desqview 386 \$125

Bring multitasking to your 386. Includes Desqview, the award winning multitasking environment. Also includes QEMM386, the memory manager for 386 machines that makes Desqview, screen and can rename your task programs and transform your extended memory into expanded (EMS 4.0) memory. Includes Manifest Memory Analyzer as an added bonus!



PC Tools Deluxe \$85

Use the collection of utilities that's won every award we've heard of! Includes Desktop Manager, disk cache and data compression. Also includes hard drive utilities such as DiskDefragmenter, defragment, backup and recovery. It also has Fast support a special version of Laplink and even more.

Pop Drop Plus	59
PrintRite	59
ProComm Plus	59
Prodigy	29
QA Plus	29
QEMM 386	49
ORAM	49
SideKick Plus	119
Sideways	59
Smartcom Exec	49
Software Carousel	69
Super PC Kwik	49
XTrem 3.0	49

FAST MICRO



Call Toll-Free:
1-800-441-3278



TERMS: No Charge for Visa or MasterCard. All orders up to 20 pounds are shipped via Federal Express. Minimum order: \$50. Shipping & handling charge: 3% (Min. \$6). Product warranties, offers & claims are handled by the manufacturer. * All opened returns are subject to 15% restocking fee. * DOA's repaired or replaced at our option. Call for return authorization (RA) number first. Shipping is not refundable. Sorry, no COD's. Personal/company checks delay shipping. AK, HI, & APO addresses add \$15 per box. Prices/availability subject to change. Purchase orders accepted (no added surcharges) from approved corporations only. AZ orders add 6.7% tax. * Excludes FastData products.

Write to: Address: 3655 E. LaSalle St., Phoenix, AZ 85040. For phone orders call: 800-441-3278. For customer service call: 602-437-0300.

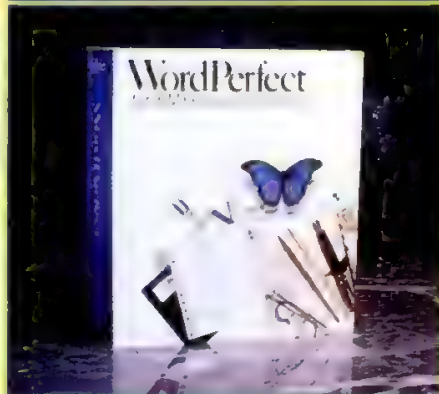
compuclassics

Your Source For Software

TO ORDER, OR INQUIRE CALL
800-733-3888
OR FAX YOUR ORDER
818-347-9977

ACCOUNTING		PC Paintbrush IV	65.00	Turbo Professional	85.00	Norton Utilities Advanced 5.0	115.00
DAC Easy Accounting	85.00	PC Paintbrush IV Plus	112.00	Zortech C++ 2.1	149.00	PC Kwik Powerpak 2.0	75.00
Packit 2000	35.00	Pazzazz Plus 2	65.00	NETWORKING		PC Tools Deluxe 4.0	87.00
Peachtree Double Bonus Pack	235.00	Presentation Task Force IIw	175.00	Lantronic 2MBPS Adapter	165.00	Power Menu	59.00
Quicken 4.0	39.00	HARDWARE & PERIPHERALS		Lantronic 2MBPS Starter Kit	359.00	Print Cache	99.00
Timeslips III	195.00	Adobe Postscript Cartridge	299.00	Lantronic Ethernet Adapter	225.00	Print Q 5.0	89.00
Turbo Tax 1040 Personal	42.00	ATI VGA Wonder+ 256 W/Mem	209.00	Lantronic Ethernet Starter Kit	509.00	Q-Dos II	39.00
Turbo Tax 1040 Professional	229.00	Best Data Traveller	169.00	Novell NE1000	169.00	Qemm 386 5.1	62.00
CAD		Best Data Traveller	169.00	Novell NE2000	199.00	Qram	52.00
Autosketch 3.0	149.00	Best Data 9624Fax/Modem Bnd	185.00	Western Digital Ethernet Plus	155.00	Software Bridge 4.1	79.00
Design Cad 3D 3.1	205.00	Canon BJ-10E Bubblejet	349.00	Western Digital Ethernet + 16	189.00	Software Carousel V5.0	55.00
Design Cad 2D 4.2	155.00	Copy II PC Option Board Deluxe	115.00	Word Perfect Office 5-Pack	329.00	Spirinite II	67.00
Generic Cadd 5.0	235.00	Hardcard IXL 50MB	409.00	Xircom Pocket Ethernet Adapter	399.00	Virex PC	75.00
COMMUNICATIONS		Intel 80387-SX	305.00	OPERATING ENVIRONMENTS		XTree Gold 2.0	95.00
Carbon Copy Plus 5.2.2	109.00	Intel Satisfaction Board	395.00	Desquivew 2.3	82.00	WINDOWS	
Close Up Customer 3.0	129.00	Logitech Bus Mouse	85.00	Desquivew 386 2.3	135.00	ABC Flowchart	185.00
Compuserve Membership Kit	22.00	Logitech Serial Mouse	75.00	DR DOS 5.0	139.00	Actar 3.0	829.00
Minior III 2.0	89.00	Logitech Scan Man Plus	159.00	Geoworks Ensemble	125.00	Adobe Type Manager	59.00
PC Anywhere IV	99.00	Logitech Scanners 256	319.00	HP New Wave	115.00	AMI Professional	305.00
Procomm Plus V2.0	65.00	Logitech Trackman Serial/Bus	89.00	MS DOS 3.3 or 4.01	72.00	Arts & Letters Graphics Editor	465.00
Reflection 2+ 4.0	225.00	MS Mouse w/Win 3.0 Ser/Bus	159.00	OS/2		Asymetrix Toolbook	299.00
Reflection 4+ 4.0	299.00	MS Mouse w/Point Serial/Bus	105.00	MS Word for OS/2	335.00	Bitstream Follafit	59.00
Smartem 340	199.00	MS Mouse w/Point Serial/Bus	105.00	MS Word for OS/2	335.00	Card Draw 2.0	389.00
Smartem 370 V1.2	135.00	Pacific Data 1-2-4 Plus w/DAB	115.00	MultiScope OS/2 Debugger 1.1	309.00	Crosslink For Windows	125.00
Smartem Exec 2.0	75.00	Pacific Data 1-2-4 Plus w/2MB	245.00	Smalltalk/V PM	299.00	Dynacore Asynch for Windows	189.00
DATABASE		Pacific Page 2/MB Memory Bnd	365.00	PROJECT MANAGEMENT		Foxit for Windows	169.00
Clarion Personal Devel 2.0	52.00	Pacific Page Personal Edition	365.00	Harvard Project Manager 3.01	455.00	Folio Views	369.00
Clarion Professional Devel 2.1	475.00	Pacific 4 Memory Board w/DAB	75.00	Scitor Project Scheduler V	429.00	Grammarik IV for Windows	52.00
Clipper 5.0	529.00	Pacific 4 Memory Board w/2MB199.00		Timeline 4.0	469.00	hDC Windows Express 3.0	52.00
Data Ease 4.2	459.00	Pacific 4 Memory Board w/4MB335.00		STATISTICS/SCIENCE		hDC First Apps	52.00
DBase IV 1.1	489.00	25-In-One Font Cartridge	269.00	Brainmaker	149.00	IBM Current 1.1	235.00
Fastbase Plus S/U 2.1	195.00	Plotter In A Cartridge	249.00	Chi Writer Deluxe	249.00	Language Master for Windows	59.00
Fastbase S/U 1.02	455.00	Plotter In A Cartridge P.E.	239.00	Derive	139.00	Micrograph Designer 3.01	485.00
Monarch 1.0	315.00	Proc. Paraph 2400 Ext V.42 Bis	215.00	Grapher	145.00	Micrograph Chroma	345.00
Paradox 3.5	525.00	Proc. Paraph 2400 Int V.42 Bis	179.00	Mathcad 2.5	319.00	MS Excel V3.0	319.00
Paradox 3.5 Upgrade	145.00	Super Cartridge 1 by IQ Engng	275.00	Mathematics 386 w/387 Supp	845.00	MS PowerPoint for Windows	319.00
PC File 5.0	89.00	Super Cartridge 2 by IQ Engng	479.00	Print A Plot 2.0	189.00	MS Project for Windows	469.00
R & R Rel Rept Writer 4.0	155.00	Workport 2400	229.00	Sigma Plot	435.00	MS Windows 3.0	99.00
UI Programmer	342.00	Workport 2400 w/WNP	339.00	Sources w/Bits	135.00	MS Windows Entertainment Pak	29.00
DESKTOP PUBLISHING		Workport 2496	669.00	SPSS/PC Plus Base	185.00	MS Windows Productivity Pack	45.00
Bitstream Fonts (each)	85.00	Workport 9600	435.00	Statgraphics	569.00	MS Windows Software Dev. Kit	335.00
Freedom of Press Light	59.00	Zoom Int 24/96	95.00	Surfer	359.00	MS Word 1.1 for Windows	325.00
Freedom of Press 2.2	249.00	Zoom Ext 24/96	105.00	Systat 5.0	649.00	MS Windows 3.0	99.00
Goscript Plus	179.00	INFORMATION MANAGEMENT		SPREADSHEET		MS Windows Entertainment Pak	29.00
PFS First Publisher 3.0	95.00	askSam 5.0	175.00	Always (Lotus 1-2-3 or SymPy)	119.00	MS Windows Software Dev. Kit	335.00
Professional Clip Art Gallery	159.00	Calendar Creator Plus 3.0	45.00	Baler XE	579.00	Omnipage 386 V3.0	469.00
Roadright	319.00	Infocrest 1.1	55.00	Impress	79.00	Omnipage Professional	655.00
The New Print Shop	39.00	Instant Recall	69.00	Lotus 1-2-3 Ver. 2.2	339.00	Owl Guide	395.00
Ultrascript Plus	279.00	Lotus Agenda 2.0	299.00	Lotus 1-2-3 Ver. 3.1	419.00	Packrat 3.0	255.00
Venture Publisher Gold	549.00	Quick Schedule Plus	62.00	Quattro Pro 2.0	319.00	Pagemaker V4.0	499.00
EDUCATION/ENTERTAINMENT		INTEGRATED		Quattro Pro Upgrade	95.00	Perform Pro	279.00
Flight Simulation 4.0	39.00	Eight in One 2.0	39.00	Sideways 3.3	59.00	Professor Windows	30.00
Kings Quest V	45.00	Lotus Works	95.00	Baler 5.1	359.00	Soft Type	115.00
Language Assistant French	45.00	MS Works 2.0	95.00	UTILITIES		Spiramaker Plus	285.00
Language Assistant German	45.00	PFS First Choice w/Prodigy	92.00	1 Dir + 3.5	49.00	Superbase 4 for Windows	425.00
Language Assistant Italian	45.00	Symphony 2.2	509.00	386 To File Max 5.1		Thair	209.00
Language Assistant Spanish	45.00	LANGUAGE/PROGRAMMING		Above Disk 4.0	65.00	WIN Connect	82.00
PC Globe 4.0	39.00	Brief 3.0	179.00	Amidisk	59.00	WinFax	49.00
Sinclair	33.00	Blue File Multitasker	119.00	Automen 4.7	39.00	Wingz	339.00
Sinclair	45.00	Blue File S.1	439.00	Blue Max for PS/2	85.00	Wordscan Plus 2MB	699.00
Test Drive II: The Passion	37.00	C Tools Plus	92.00	Brooklyn Bridge 3.0	89.00	Xerox Formbase 1.1	319.00
Where In The World... Deluxe	52.00	Kedit	105.00	Central Point Back-up	63.00	WORD PROCESSING	
FORMS/FLOWCHARTING		MS Macro Assembler	99.00	Check It	85.00	IBM Displaywrite V 2.1	245.00
Flowcharting III	145.00	MS Basic 7.1 Devel System	329.00	Copy II PC 6.0	27.00	Facelift for Wordperfect	59.00
Formtool Gold	59.00	MS C 6.0	329.00	Copywrite	65.00	Grammarik IV	52.00
Formtype Complete	169.00	MS Fortran 5.0	299.00	Direct Access 5.0	65.00	MS Word 5.5	229.00
Interactive Easyflow 6.1	105.00	MS Quick Basic 4.5	67.00	Disk Manager	39.00	Professional Write w/Pro File	165.00
Org Plus Advanced 5.0	65.00	MS Quick C 2.5	67.00	Disk Technician Gold	95.00	Rightwriter 4.0	55.00
Perform 2.1	85.00	Norton Editor 2.0	68.00	Fastback Plus 2.1	115.00	WordPerfect 5.1	249.00
GRAPHICS		Object Professional 1.1	129.00	Headroom 2.0	65.00	WordPerfect 5.1 Station	159.00
Dan Bricklin Demo 1.3.0	189.00	Powerbasic	79.00	Lap Link Release III	92.00	WordStar 6.0	249.00
Deluxe Paint II Enhanced	85.00	Power Tools Plus	92.00	Lotus Magellan 2.0	109.00	XENIX/UNIX	
Drawperfect 1.1	279.00	Smalltalk V 286	129.00	Make Utilities 1990	92.00	Interactive Unix Op Sys 1-2 User	329.00
Freelance Plus 3.01	329.00	Turbo C++ Professional	199.00	Move Em (286 to the Max)	55.00	Interactive Dev. System	509.00
Harvard Graphics 2.3	299.00	Turbo C++ Prof Upgrade	149.00	Nethrom (10 User)	159.00	SCO Foxbase + 386	715.00
Hipack 2.0	99.00	Turbo C Tools	92.00	Nethrom Single User	49.00	SCO Unix Develop Sys 386	715.00
Hot Shot Graphics	149.00	Turbo Pascal 6.0	99.00	Norton Antivirus	89.00	SCO VP/IX (Unlimited)	645.00
Inset Plus (w/Hipack)	135.00	Turbo Pascal Professional 6.0	199.00	Norton Commander 3.0	99.00	SCO VP/IX (2 User)	355.00
						Wordperfect for SCO	
						Xenix 5 User	509.00

PRE-SPRING SPECIALS
BUY KNOWLEDGE PRO WINDOWS FOR \$625
and GET Math Toolkit FREE!
BUY FREELANCE PLUS RECEIVE CALCULATOR/PEN SET FREE!
BUY PC TOOLS RECEIVE A PC TOOLS KEY RING FREE!
BUY LOTUS 1-2-3 v3.1 AND GET FREE AMI PRO (19.95 MANUFACTURER'S SHIPPING CHARGE) AND RECEIVE NEXT 1-2-3 UPGRADE FOR \$49 (OFFER VALID UP TO 6 MONTHS FROM PURCHASE DATE)
BUY ANY SPC SOFTWARE GET HARVARD GRAPHICS MOUSE PAD FREE
All promotions good while supplies last



WORDPERFECT® 5.1 Includes the Tables feature which automatically encloses data you create. The Equation Editor includes an extensive collection of symbols, characters, and mathematical functions. You can define mailing label formats, hyphenation is now dictionary-based, mouse support is offered, and spreadsheets can be imported into WordPerfect 5.1 documents.

Special Value \$249.00



RUN YOUR 386 TO THE MAX! 386MAX and BlueMAX for PS/2s let you get MAXimum performance out of your 386. Unique FlexFrame technology allows 386MAX to load more programs into high DOS than any other memory manager. Both are Windows 3.0 compatible, and our exclusive instancing capabilities allow many resident programs to run reliably in the Windows environment.

386MAX \$72. BlueMAX \$85.

A GREAT DEAL IN ANY LANGUAGE!
... TRANSLATE ENGLISH into
Spanish, French, German or Italian
LANGUAGE ASSISTANT
ONLY \$45 each

PLEASE CALL FOR PRODUCT LISTINGS.
 We maintain a complete and up-to-date international
 updates and new products & software releases.
 Please don't miss out on this opportunity.

800-733-3888/818-347-7500/FAX 818-347-9977

Immediate shipment on purchase orders from government and state agencies, cities, counties, school and universities. • Prices subject to change without notice. • We ship the latest versions. • We accept Visa, MasterCard, and American Express. • 2% surcharge on American Express. • 15% restocking fee for all non-defective items returned. • Please call (818) 347-9400 for an authorization number on defective goods or your return will not be accepted. • Due to copyright laws we cannot take back any software where the seal has been broken. • (Domestic Sales) \$5.50 minimum shipping per item, less on bulk orders. • \$10 Blue Label shipping. • \$4.50 C.O.D. charge. • International sales call for freight pricing. • Heavier items are charged accordingly. • We do not guarantee compatibility. • Call for prices for any software item not included in this ad. • Order desk open 7 A.M. to 5 P.M. Monday to Friday (PST), Saturday 10 A.M. to 2 P.M.

P.O. Box 10598, Canoga Park, CA 91309 • Showroom: 7959 Deering Ave., Canoga Park, California 91304.

CIRCLE 205 ON READER SERVICE CARD



READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions.
2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about.
3. The literature will be mailed to you by the advertiser free of charge.

CIRCLE FOR FREE INFORMATION

Valid after July 31, 1991

41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92																																																			
93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196
197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248
249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352
353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404
405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456
457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508
509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612
613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664
665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716
717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768
769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872
873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924
925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976
977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000																												

PC 4/30-6

1. Do you work in a DP/MIS department?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity. (Check one only.)

01. ☐ Manufacturer of Computer Equipment, Computers, Software
02. ☐ Manufacturer—Aerospace
03. ☐ Manufacturer—Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government—Federal
11. ☐ Government—Non-Federal
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture

16. ☐ Agriculture/Construction/Mining/Oil/Transportation/Utilities
17. ☐ Non-Computer Retailer/Distributor
18. ☐ Other Business or Service
99. ☐ Other

3. Please indicate your primary business function. (Check one only.)

01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.
99. ☐ Other

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products?

01. ☐ 10 or less 03. ☐ 26-99
02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office? (Check all that apply.)

01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location. (Check all that apply.)

01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh

8. Do you plan to buy any PC Products?
01. ☐ Now
02. ☐ In 4 to 6 months
03. ☐ In 7 to 12 months
04. ☐ No definite plans

9. Number of Employees in your entire company:
01. ☐ 25 or less
02. ☐ 26-99
03. ☐ 100-499
04. ☐ 500-999
05. ☐ 1000 or more

Please print.

Name _____

Title _____ Phone (____) _____

Company _____

Address _____

City _____ State _____ Zip _____

Signature _____ Date _____

☐ Please send me one year (22 issues) of PC Magazine for \$29.97. Offer valid in U.S. only.



READER SERVICE CARD FREE INFORMATION

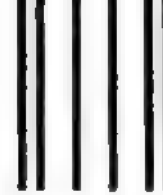
IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions.
2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about.
3. The literature will be mailed to you from the advertiser free of charge.

CIRCLE FOR FREE INFORMATION

Valid after July 31, 1991

FREE INFORMATION																																																					
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92		
93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144		
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196		
197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250
249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300		
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352		
353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404		
405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456		
457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510
509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560		
561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612		
613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664		
665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716		
717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768		
769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820		
821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872		
873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924		
925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975			
976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000																													



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. BOX 1687
RIVERTON, NJ 08077-9687



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. BOX 1687
RIVERTON, NJ 08077-9687



TOP COMPUTERS

SHIBA	ALL MODELS	SPECIAL
AST PREMIUM EXECUTIVES	286 & 386	SPECIAL
NEC	PROSPEED ALL MODELS	SPECIAL
PANASONIC	CF170/CF270	CALL
COMPAQ	ALL MODELS	CALL
SHARP	PC6220 286/VGA/20MB	SPECIAL
PACKARD BELL	P8286N8 20MB VGA	SPECIAL
TEXAS INSTRUMENT	TM2000/TM3000	SPECIAL

COMPUTERS

COMPAQ	386 20E W/40MB DRIVE	2749
COMPAQ	386S W/80MB DRIVE	2249
PACKARD BELL	ALL MODELS	CALL
AST PREMIUM	386SX MODEL 5	1559
AST PREMIUM	386/25 MODEL 5	2995
AST PREMIUM	486/25E MODEL 5	4999
WYSE TERMINALS	30/50/60	294/375/298
DTK	8086/286/386/486	CALL FOR CUSTOM QUOTES

DISC DRIVES / TAPE BACKUP

COLORADO DJ-10	40-120MB INT TAPE DRIVE	245
COLORADO DJ-20	120-250MB INT TAPE DRIVE	349
MOUNTAIN	40meg int/ext	249/CALL
MAYNARD	40/60/150MB INT/EXT	CALL
MICROPOLIS	1654-7 161MB ESDI 16 ms	849
MAXTOR LXT213A	206MB IDE 3.5" 15ms	799
SEAGATE	ST251-1 40MB MFM 5.25" 28ms/242	
SEAGATE	ST1144A 124MB IDE 3.5" 19ms	489
CONNER HARD DRIVES	ALL MODELS	CALL
TOSHIBA	1.44MB Floppy 3.5"	79
PLUS HARD CARD H XL	50/105MB	379/CALL

MATH CO-PROCESSORS

INTEL	80287XL	189
INTEL	80387SX	288
INTEL	80387-16	319
INTEL	80387-20	365
INTEL	80387-25	449
INTEL	80387-33	559
CYRIX	80387-20	309
CYRIX	80387-25	389
CYRIX	80387-33	475
WEITEK	ALL MODELS	CALL

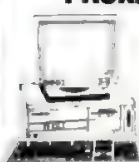
POWER DEVICES

APC	MODEL 520 UPS	315
TRIPP LITE	BC450 UPS	298
TRIPP LITE	ISO BARS	ALL MODELS

FAX MACHINES

SHARP	ALL MODELS	CALL
MURATA	M1100/M1850	539/775
PANASONIC	PANAFAX MODELS	CALL
CANON	FAXPHONE 23	769
EPSON	FAX 1000 W/paper cutter	435

PACKARD BELL FORCE 1



- 286 12MHz 1MB-RAM
- 0-wait state memory
- 5.25" & 3.5" floppies
- 40MB hard drive
- Lotus Works software
- MS-DOS 4.01 & GW-Basic
- 1-Year On-Site Warranty

\$995 Monitor Optional

APRIL SPECIALS

NEC SILENTWRITER 2

- MODEL 90
- PC Magazines Editor's Choice
- Adobe Postscript & HP emulation
- 2M RAM (expandable to 4MB)
- 35 built-in Postscript fonts
- Parallel, serial & Appletalk

\$1589

DTK 386 25MHz SYSTE

- 80386 25MHz w/1MB-RAM
- 5.25" or 3.5" floppy
- 89MB 19MS hard drive
- 1024x768 video card
- 101 key keyboard
- 1-32bit, 5-16bit, 2-8bit slots
- 2 ser 1-par, 1-game ports

\$1699

MONITORS

NEC GS2A	14" mono VGA	205
NEC IIA	14" 800x600	465
NEC 3D	14" 1024x768	609
NEC 4D	16" multisync 1024x768	BEST
NEC 5D	20" multisync 1280x1024	PRICE
PACK BELL PB8529VG	14" VGA 640x480 31mm	339
PACK BELL PB8541VG	14" VGA 640x480 41mm	295
GOLDSTAR	ALL MODELS	CALL
EMERSON	ALL MODELS	CALL
MITSUBISHI	ALL MODELS	CALL
ZENITH 1492	14" VGA flat 640x480	592
PRINCETON	ULTRA-1200/ULTRA-1400	CALL
SAMSUNG	ML4571 14" MONO WHITE VGA	139
SAMSUNG	MULTISYNC 14" 800x600	439
SEIKO	1440/1450 14" VGA 25mm	515/659
PANASONIC	PANASYNC 1381 1024x768	395
SONY	CPD-1304 14" 1024x768 25mm	649

VIDEO CARDS

ATI VGA WONDER+	w/mouse 256K/512K	189/229
CARDINAL-200	800x600 VGA	88
CARDINAL-600	1024x768 VGA	159
HERCULES GRAPHICS STATION	1MB/3MB	CALL
PARADISE VGA+/VGA+16		SPECIAL
PARADISE 8514/A+		469
VIDEO 7 1024/256K/512K		179/209
ORCHID Pro Design II	512K/1MB	279/315
NEC GRAPHICS ENGINE BOARD 16		595
NEC GRAPHICS ENGINE BOARD 256		889

MODEMS AND MISC

SOUNDBLASTER		157
AD-LIB MUSIC CARD		119
INTEL SATISFACTION BOARD	IN-STOCK	
ADOBE POSTSCRIPT CART FOR LASERJET II		279
CARDINAL 2400BAUD/INT W/MNP-5		99
MEGAHERTZ MODEMS FOR LAPTOPS	CALL	
MICROSOFT MOUSE ALL VERSIONS	CALL	
MICROSOFT WINDOWS 3.0 W/MOUSE		109
EXPANZ DATA COMPRESSION CARD		149
LOGITECH C9 SERIAL MOUSE		79
LOGITECH TRACKMAN		95
LOGITECH 2 BUTTON SERIAL MOUSE		49

NETWORKING

NOVELL ELS LEVEL I	4-USER	CALL
NOVELL ELS LEVEL II	8-USER	CALL
NOVELL ADVANCED NETWORK 2.15		1859
NOVELL NETWORK 386 V3.1		CALL
NE1000/NE2000 BOARDS		155/189
LANTASTIC ETHERNET STARTER KIT		515
SMC, 3COM, THOMAS CONRAD, DIGIBOARD AND WESTERN DIGITAL	CALL FOR PRICING	

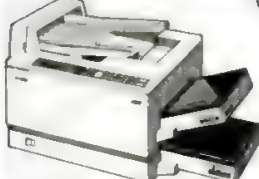
PACKARD BELL FORCE 386X

- 386SX 16MHz 1MB-RAM
- 0-wait state memory
- 5.25" & 3.5" Floppies
- 40MB HD (84 & 124MB Optional)
- Lotus Works software
- MS-DOS 4.01 & GW-Basic
- 1-Year On-Site Warranty

\$1195 Monitor Optional

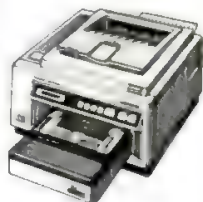


Panasonic
Office Automation



KX-P4450I LASER PARTNER

- Fast 11 pages/minute at 300 DPI
- Two 250 sheet trays
- Individual sheet loading
- 512K (max. 4.5MB) 28 fonts
- Emulates HP Laser II & Epson
- 1-year warranty



KX-P4420 PERSONAL LASER PARTNER

- 8 Pages per minute
- One 250 sheet tray
- 300 DPI resolution
- 512K Ram 22 internal fonts
- HP Emulation
- 1-year warranty



KX-P1180 & KX-P1191

- 9-pin printer.
- 240cps draft (192cps KX-P1180).
- Rear, top or bottom paper feed.
- Push/pull tractor.
- 6K buffer (2K on KX-P1180).
- Auto paper loading feature
- Paper parking feature.
- Emulates Epson & IBM.
- 2 year Panasonic Warranty.



KX-P1124 & KX-P1624

- 24 pin high resolution printer.
- 192cps draft printing speed.
- Rear, front, top or bottom paper feed.
- Push/pull tractor.
- Auto paper loading.
- Paper parking.
- 6K buffer. (12K on KXP-1624)
- Emulates Epson and IBM.
- 2 year Panasonic warranty.

**MIDWEST
COMPUTER
WORKS**

350 Lexington Drive, Buffalo Grove, IL 60089

**DIRECT
ORDER
LINE**

800-669-5208

CUSTOMER SERVICE 708-459-6883 • FAX 708-459-6933

ORDERS SHIPPED WITHIN 24 HOURS • IF YOU FIND A BETTER PRICE CALL US
CIRCLE 489 ON READER SERVICE CARD



- C.O.D. orders accepted
- Your credit card is not charged until the product is shipped
- Personal and company checks will delay order 2 weeks
- Call us for quantity discounts
- Prices subject to change
- We check for stolen credit cards
- Prices reflect a cash discount
- Foreign orders welcome

28mm

1024 x 768

BUS VGA MULTI-SYNC

\$299



- 1024 x 768 Res., 0.28mm Dot Pitch
- 4" Diagonal, 90 Degree Screen
- Longlife, Etched Screen
- Analog Infinite Colors
- 9.8" x 7.3" Display Areas
- 31.5kHz to 38kHz Horizontal Sync
- Non-interlaced and Interlaced
- 40MHz Video Bandwidth
- 15 Pin D-connector
- 15.32"W x 14.44"H x 15.28"D
- IBM 8514A, Compatible



\$99
WORLD'S FIRST
DOUBLE "F" KEY

**1-Year
GE On-Site
90-DAY MONEY BACK**

ORCHID VGA CARD

- 16-Bit 1MB on Board
- Autosensing 8 or 16-Bit Bus
- 1024 x 768 256-Color

\$199

25MHz 386VGA

- 4MB Memory RAM
- 1.2MB and 1.44MB Drives
- 100MB 17ms IDE Drive
- 14" 1024x768 VGA Monitor
- ATI 16 Bit 512K VGA Card
- 1 Parallel & 2 Serial Ports
- 101 Key Keyboard
- 7-Bay Vertical Case w/220W

\$2,299

33MHz 386VGA

- 64K Cache RAM
- 4MB Memory RAM
- 1.2MB and 1.44MB Drives
- 200MB 15ms IDE Drive
- 14" 1024x768 VGA Monitor
- ATI 16 Bit 512K VGA Card
- 1 Parallel & 2 Serial Ports
- 101 Key Keyboard
- 7-Bay Vertical Case w/220W

\$2,699

16MHz 386SX VGA

- 2MB Memory RAM
- 1.2MB and 1.44MB Drives
- 43MB 25ms IDE Drive
- 14" 1024x768 VGA Monitor
- ATI 16 Bit 512K VGA Card
- 1 Parallel & 2 Serial Ports
- 101 Key Keyboard
- AT Case w/200W & 101KB

\$1,599

12MHz 286VGA

- 1MB Memory RAM
- 1.2MB and 1.44MB Drives
- 43MB 25ms IDE Drive
- 14" 1024x768 VGA Monitor
- ATI 16 Bit 512K VGA Card
- 1 Parallel & 2 Serial Ports
- 101 Key Keyboard
- AT Case w/200W & 101KB

\$1,299

25MHz 15MHz

- 64K Cache RAM
- 8MB Memory RAM
- 1.2MB and 1.44MB Drives
- 200MB 15ms IDE Drive
- 14" 1024x768 VGA Monitor
- ATI 16 Bit 512K VGA Card
- 1 Parallel & Serial Ports
- 101 Key Keyboard
- 7-Bay Vertical Case w/220W

\$3,699

25MHz EISA 486VGA

- 64K Cache RAM
- 8MB Memory RAM
- 1.2MB and 1.44MB Drives
- 200MB 15ms IDE Drive
- 7 EISA and 1 AT Slots
- 14" 1024x768 VGA Monitor
- ATI 16 Bit 512K VGA Card
- 1 Parallel and 2 Serial Ports
- 101 Key Keyboard
- 7-Bay Vertical Case w/220W
- 64MB on Board RAM Opt.
- 128/256K Cache RAM Option
- EISA ESDI Controller Opt.

\$4,099

33MHz EISA 486VGA

- 64K Cache RAM
- 8MB Memory RAM
- 1.2MB and 1.44MB Drives
- 200MB 15ms IDE Drive
- 7 EISA and 1 AT Slots
- 14" 1024x768 VGA Monitor
- ATI 16 Bit 512K VGA Card
- 1 Parallel and 2 Serial Ports
- 101 Key Keyboard
- 7-Bay Vertical Case w/220W
- 64MB on Board RAM Opt.
- 128/256K Cache RAM Option
- EISA ESDI Controller Opt.

\$5,699



PORTABLE VGA OR MONO

- 15" 6.25mm VGA Monitor
- 3 Drive Slots
- 5 Full Expansion Slots
- 101 Key Keyboard
- 16"W x 8.3"H x 16"D
- Weights 22lbs SKD

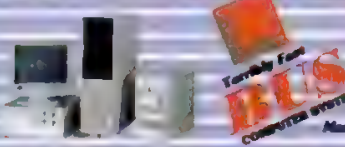


PORTABLE Plasma VGA

- 16" 640 x 480 Plasma
- 3 Drive Slots
- 5 Full Expansion Slots
- 80 x 25 Character Display
- External VGA Monitor
- 16.1"W x 6.3"H x 8.5"D
- Weights 13.5lbs SKD

800-451-5279

In New York City Call: 212-627-4485
FAX Orders Dial: 212-627-9884
Tech Help Call: 212-627-9573
Frankfurt, Germany: 49-69-410027
APO, FPO, OEMs, Co., Univ. POs
Open Monday through Saturday
MasterCard, VISA and C.O.D., No Surcharges
135 West 26th St., 8th Floor
New York, New York 10001



CIRCLE 273 ON READER SERVICE CARD



WHY PAY RETAIL?

CDW™ Sells For Less

AND SERVICES YOU BETTER

CDW™: RATED #1
IN AN INDEPENDENT
SURVEY OF READERS
BY **PC MAGAZINE**

WHY PAY RETAIL? CDW™ SELLS OKIDATA® FOR LESS!

OKIDATA® OL400



• 4 PPM • 300 DPI Res. • 512 KB Std. RAM • 2.5 MB Max. RAM • 17 Fonts • Output Tray • 200 Sheet Input Tray • Manual Feed Input • Centronics Parallel Interface • RS-232 Serial Interface (Opt.)

Feature	OL400	HP® IIP	CDW Price
Price	\$1295	\$1295	\$627.08 CDW Part #12884
Paper Input	200	50	
Fonts/Typefaces	17/4	14/2	
Printhead Warranty	5 yr.	1 yr.	

Feature	OL800	HP III	HP® IIP	CDW® Price
Price	\$1499	\$2395	\$1295	\$949.66 CDW Part # 14071
Second Bin Option	Opt.	N/A	Opt.	
Fonts/Typefaces	26/4	17/4	14/2	
Printhead Warranty	5 yr.	1 yr.	1 yr.	

OKIDATA® OL800



• 8 PPM • 300 DPI Res. • 512 KB Std. RAM • 4.5 MB Max. RAM • 200 Sheet Input Tray • Manual Feed Input • 26 Fonts • Centronics Parallel Interface • RS-232 Serial Interface (Opt.)

OKIDATA® OL820



• 8 PPM • 300 DPI Res. • 512 KB RAM • 4.5 MB Max. RAM • 26 Fonts • 200 Sheet Input Tray • Manual Feed • Centronics Parallel Interface

Feature	OL820	HP III	CDW Price
Price	\$1399	\$2395	\$1266.30
Font Scaling	Hardw.	Firmw.	
Scalable Fonts	13	8	
Emulations	HP, IBM Diablo	HP	
Second Paper Tray	\$289 + \$89	None	CDW Part #11780
CALL A CDW REP TODAY!			

Feature	OL840	HP III W/PS	CDW Price
Price	\$2999	\$3425	\$1896.67
Font Scaling	Hardw.	Firmw.	
PostScript Fonts	35	35	
Second Paper Tray	\$289 + \$89	None	
AppleTalk®	Included	\$275	CDW Part #16172

OKIDATA® OL840



• 8 PPM • 300 DPI Res. • 2 MB RAM • 4 MB Max. RAM • 26 Fonts • 200 Sheet Input Tray • Manual Feed Input • Centronics Parallel Interface • RS-232/422 Serial Interface • AppleTalk (8-Pin DIN) Interface

Microline 320 & 321

✓ 9-Pin ✓ 300 CPS Draft ✓ 63 CPS NLQ ✓ Epson Emulation
✓ IBM Compatible
Model 320 **\$314.68** CDW 15676
Model 321 **\$439.94** CDW 10515

Microline 390 & 391 Plus

✓ 24-Pin Printhead ✓ 270 CPS Draft ✓ 90 CPS NLQ ✓ IBM & Epson Compatible
Model 390 **\$442.22** CDW 10971
Model 391 Plus **\$596.41** CDW 12556

Microline 393 Plus

✓ 24-Pin ✓ 520 CPS Draft ✓ 120 CPS NLQ ✓ 16-inch Paper Width ✓ Top/Bottom Paper Feed ✓ Parallel & Serial ✓ IBM Compatible
CDW Price **\$948.90** CDW 15706
Color Model **\$999.50** CDW 11408

OKIDATA®

PRINTERS



COMPUTER DISCOUNT WAREHOUSE



MaxStation 286 Personal Computer

- 80286 Processor with Dual Speeds (12.5 & 8MHz)
- 1 MB RAM Standard
- One 5.25", One 3.5" Floppy
- Internal 40MB 28ms Hard Disk Drive
- 16-bit VGA Video with 256K RAM

\$945.60

MAGNAVOX



WHY PAY RETAIL?

**CDW Sells
For Less**
AND SERVICES YOU BETTER

**CDW: RATED #1 IN AN
INDEPENDENT SURVEY OF
READERS BY PC MAGAZINE**

EPSON



EPL 7000 Laser Printer

- 6 PPM • 512KB RAM Std., Exp. to 2MB • 300 x 300 DPI Res.
- 14 Resident Fonts • 2-Year Limited Warranty • HP Compatible
- Free 65 in 1 Font Cartridge..... Call A CDW Rep For Price

LQ1010	\$199.00	LQ510	\$259.00
LQ850	429.00	LQ1050	599.00
FX850	267.00	FX1050	399.00
LQ2550	849.00	EPL 7000 Laser	CALL
LQ1010	399.00	EPL 7500 Laser PS	CALL

HARDWARE, SOFTWARE & PERIPHERALS AT DISCOUNT PRICES

COMPUTERS

MAGNAVOX	
MAX STATION 286 40MB VGA Interface	\$945.60
MAX STATION 386SX 40MB VGA Interface	1398.46

Packard Bell 286 NOTEBOOK	\$1705.44
FORCE 1 286 10MB 1 MB VGA Adap	986.27
FORCE 386SX 16MB 124 MB VGA 2MB	1974.71
FORCE 386SX 40MB VGA Interface	1158.80
FORCE 386SX 40MB VGA Interface	1199.63
FORCE 386SX 40MB VGA Interface	1411.79
PB 386-32 2 MB 3.5" 5.25" Drives	1879.60

Panasonic	
CF170 XT 10MHz • 1MB • 100K Laptop	\$1439.53
CF 270 286 16MHz • 2MB • 100K Laptop	1937.11

PS/2 3026 30MB \$1738.89	PS/2 65SX 60MB \$3675.82
PS/2 501 30MB 1839.21	PS/2 70E 60MB 2827.78

PS/2 55SX 30MB	2427.47	PS/2 55SX 60MB...	2719.40
COMPAQ			
LTE 286 Mdl 2L	\$2443.45	DP386/20E Mdl 1	\$2446.46

DP 38625E Md 1	3727.32
CPO 386/33	CALL
SLT 386S20 Md 00	4736.28

SAMSUNG

TEXAS INSTR.	
TEXAS INSTR. TRAVEL MATE 2000	\$1045.11
TEXAS INSTR. TRAVEL MATE 3000	CALL

HP, IBM & COMPAQ MEMORY	
1MB IBM PC/XT Memory Module	\$105.23
2MB IBM PC/XT Memory Module	194.00
4MB IBM PC/XT Memory Module	350.00

8MB Memory Module	429.00
4MB Modular 429.00	129.00
4MB PC/XT 429.00	350.00
4MB PC/XT 429.00	385.00
4 MB AST 429.00	CALL
2 MB Epson 429.00	218.00
2 MB Epson 429.00	189.00
4MB upgrade HP LaserJet II/III	362.00
IBM Personal System II Memory	160.00
2 MB Memory Module IBM Mod 7050Z	160.00
1 MB IBM upgrade 4MB upgrade	136.00
2MB upgrade Toshiba 124	179.12
2MB upgrade Toshiba 124	179.12
2MB upgrade Toshiba 124	179.12
	CALL

WYSE TERMINALS

WYSE 9600 Analog Video	\$349.11 / 286.95
WYSE 9600 Analog Video	359.00 / 278.89
WYSE 9600 Analog Video	359.00
WYSE 9600 Analog Video	265.56

CD-ROM & WORM DRIVES

HITACHI 3000G16	\$456.81 / 530.68
NEC External	516.85 / 329.55
NEC Portable CD w/Software Bundle	549.00
SONY 3000G16	2069.91
SONY 3000G16	2069.91
TOSHIBA CD-ROM AT External	567.05

MATH COPROCESSORS

INTEL 8087-XT	\$115.90	INTEL 80387-SX	\$294.82
INTEL 8087-XLT	193.55	INTEL 387SX20	312.24
INTEL 8087-XLT	189.50	INTEL 80387-25	449.00
INTEL 80387-XLT	368.65	INTEL 80387-33	548.20
CYRIX FastMath	286.90/298.28		
CYRIX FastMath	MHz	389.29/465.70	

**MOST ORDERS RECEIVED
BY 5:00 P.M. C.D.T.
SHIP SAME DAY**

DOT MATRIX & LASER PRINTERS

EPSON			
LX810	\$168.00	LQ510	\$299.00
LQ850	429.00	FX850	267.00

CDW stocks all cut sheet feeders and ribbons.
NEC

Scientific 90	\$159.00	PS300 Now Model	\$626.90
PS200 24-pin	467.70	LC200 Postscript	2472.92
PS300 24-pin	272.22	PS300 24-pin	376.33
PS300	565.50		

DICOMINIX by KODAK	
150 Parallel / 150 Serial	\$329.07 / 330.07

150 Parallel / 150 Serial	\$329.07 / 339.07
OKIDATA	

ML182 Turbo	\$229.48	ML380+	\$449.98
OKILASER 400	\$277.08	ML391+	\$599.98
OKILASER 800	\$449.88	ML380	\$299.98
OKILASER 820	\$288.30	ML393+	\$949.98

OKLASER 640	1000.07	ML383 + Color	99
ML320	314.68	ML321	43
Panasonic			

PACIFIC DATA 25 in 1 Cart. LAS3	\$265.91
PACIFIC DATA Page Postscript 4 HP LAS3	349.44
PACIFIC DATA Connected 168 256K	272.79
PACIFIC DATA 1 MB Upgrade for LaserJet II	169.00
PACIFIC DATA 1 MB Upgrade for LaserJet II	CALL
POSTSCRIPT CART W/2MB HP LAS2	339.00
CPI JETMEMORY 1MB for HP/IBM/MS	129.80
CPI JETTRAP for HP/IBM/MS Postscript	208.72
CPI SUPERSET+ 425 Fonts for all HP Lasers	208.67

PRINTERS	
CANON B110E Bubble Jet	\$330.68
CITIZEN GSX 140	285.55
CITIZEN GSX 200	CALL

BOARD PRODUCTS	
AST SixPack 288 OK	\$99.80
INTEL Above Board Plus 8 w/2 MB	486.66
INTEL Above Board Plus 512K	325.66
INTEL Inboard 386/PC	466.00
INTEL SateFaxion Fax Board	374.50

DRIVES, TAPES & CARDS

CONNER 42 MB 104 MB	\$295.40 / 498.24
CONNER 84 MB / 204 MB	469.20 / 839.00
IONEGA B144/B44 Trans	916.85 / 987.73
PLUS Hardcard 104 MB	658.46
PLUS II 80 Meg Hard Card	847.77
PLUS Hardcard 104 MB	399.80
SYSGEN 5 25" 3.5" External Floppy	209.25
PACIFIC RIM 5 25" 3.5" External Floppy for Laptops	185.56
TOSHIBA 106MB IDE AT Hard Drive	499.50

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

1654-7 182MB H-H	794.30	1684-7 340 MB	\$1323.52
1664-7 345MB H-H	1243.65	1558 336 MB ESDI	1296.50

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

ST225 20 MB	\$182.35	SEAGATE 4096 B0	\$539.74
ST238 30 MB	198.82	SEAGATE ST 25.1	243.10
ST438 329 MB 1392.94	ST1126A 111 MB	552.32	
ST1482 160 MB	874.44	ST1162A 143 MB	708.13
ST1482 84 MB	298.00	ST1157A 44 MB 3.5	234.17
ST1144A 120MB IDE			485.10

MODEMS & COMMUNICATIONS

2400 Internal	\$156.75	2400 External	\$167.94
2400B MNP	193.72	2400 External MNP	217.11
9600 External	485.40	PS2 Internal 2400	222.22

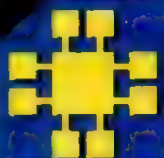
2400MNP Int.	\$169.11	2400 Int.	\$128.86
V42BIS	198.80	2400ISA	167.97
9600 V32/42BIS	447.67	Pocket 2400	98.50

2400 External	\$25.84	2400B Internal	\$224.43
ULTRA 9600 Ext.	785.55	2400 PS/2	\$34.40

Comer 2400	\$78.80	2400B	198.70
Dual 14,400 HST	\$88.85	14,400 HST	\$88.80

U.S. Robotics			
Couner 2400	279.00	2400B	199.73
Dual 14,400 HST	309.85	14,400 HST	309.85

COMMUNICATIONS PRODUCTS	
AST 525-111 • Enhanced Local	\$467.75
AST 525-111 • PS/	



JDR Microdevices

2233 Branham Lane, San Jose, CA 95124

MOTHERBOARDS



16MHz MINI 386-SX \$399⁹⁵

• NORTON SI 15.3 • LANDMARK AT SPEED 20.8

• EXPANDABLE TO 8MB ON BOARD • AMI BIOS • CHOOSE 0 OR 1 WAIT STATE FOR USE WITH SLOWER RAM • FIVE 16 BIT AND THREE 8 BIT SLOTS • CHIPS & TECHNOLOGY "NEAT" CHIPSET • SOCKET FOR 80387 SX CO-PROCESSOR • 8.5" X 13" SIZE FITS MINI-286 & FULL-SIZE 286 CASES

MCT-386SX			\$399.95
MCT-386SX-20	20MHz Mini 386 SX		\$499.95
MCT-M386-25	25MHz Mini 386		\$799.00
MCT-386MBC-33	FULL-SIZE 33MHz CACHE 386		\$1195.00
MCT-386MBC-25	25MHz VERSION		\$999.00
MCT-486MB33	33MHz CACHE 486		\$2495.00
MCT-486MB25	25MHz CACHE 486		\$1995.00
MCT-M286-20N	20MHz 286 W/NEAT		\$389.95
MCT-M286-16N	16MHz 286 W/NEAT		\$289.95
MCT-M206-12	12MHz 286		\$199.95



101-KEY \$69⁹⁵

101-KEY WITH 12 FUNCTION KEYS • 286/386/486 COMPATIBLE	
BTC-5339	\$69.95
FC-3001	101-KEY 12 F. KEYS & CALCULATOR \$74.95
BTC-5060	84-KEY WITH 10 FUNCTION KEYS \$59.95

DYNAMIC RAMS

PART#	SIZE	SPEED	PINS	PRICE
4104-100	85536x1	100ns	18	3.30
TMS4464-12	65536x4	120ns	18	3.95
41256-150	262144x1	150ns	16	1.95
41256-120	262144x1	120ns	16	2.15
41256-100	262144x1	100ns	16	2.25
41256-80	262144x1	80ns	16	2.75
414256-100	262144x4	100ns	20	8.95
414256-80	262144x4	80ns	20	9.95
TMS-120	1048576x1	120ns	18	7.95
TM48-100	1048576x1	100ns	18	8.95
TM48-80	1048576x1	80ns	18	9.95
TM48-70	1048576x1	70ns	18	10.75
TM48-60	1048576x1	60ns	18	11.05

SIMM/SIP MODULES

PART#	SIZE	SPEED	FOR	PRICE
421256A9B-80	256K x 9	80ns	SIMM-PC	33.95
421000A9B-10	1MB x 9	100ns	SIMM-MAC	79.95
421000A9B-10	1MB x 9	100ns	SIMM-PC	79.95
421000A9B-80	1MB x 9	80ns	SIMM-PC	89.95
421000A9B-60	1MB x 9	60ns	SIMM-PC	99.95
421000A9B-40	256K x 9	80ns	SIP-PC	33.95
421000A9B-10	256K x 9	60ns	SIP-PC	39.95
421000A9B-10	1MB x 9	100ns	SIP-PC	79.95
1MBx9SIP-80	1MB x 9	80ns	SIP-PC	89.95

MATH CO-PROCESSORS



• Manual
• Software guide
• 3 Year Warranty

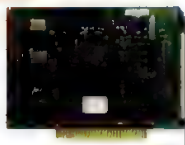


PART#	SPEED	PRICE
80387-5	5 MHz	\$89.95
80387-10	10 MHz	\$129.95
80387-12	12 MHz	\$159.95
80387-16	16 MHz	\$199.95
80387-20	20 MHz	\$299.95
80387-25	25 MHz	\$499.95
80387-33	33 MHz	\$649.95
80387-SX	16 MHz	\$299.95
80387-SX20	20 MHz	\$399.95

INTERFACE CARDS

HIGH DENSITY CONTROLLER \$49⁹⁵

• 8088/286 COMPATIBLE
• SUPPORTS 2 FLOPPIES
• 360K, 720K, 1.2MB & 4.4MB
• USER SELECT AS PRIMARY OR SECONDARY (3RD OR 4TH) FLOPPY



MCT-FDC-HD		\$49.95
MCT-FDC-HD4	4 FLOPPY VERSION	\$59.95
MCT-HDC	HARD DISK CARD	\$79.85
MCT-RLL	RLL HARD DISK CARD	\$89.95
MCT-FAFH	16-BIT F.H. 1.1 CARD	\$149.95
MCT-AFH-RLL	16-BIT RLL F.H. CARD	\$199.95
MCT-IDEIO	16-BIT MULTITHIOIDE CARD	\$89.95
MCT-MIO	MULTITHIO CARDS	\$59.95
MCT-MIO	MULTITHIO FLOPPY	\$79.95
MCT-AIO	16-BIT MULTITHIO	\$59.95
MCT-MGEIO	16-BIT ALL-IN-ONE	\$129.95
MCT-AEMS	16-BIT EMS CARD	\$129.95
MCT-EEMS	16-BIT EEMS CARD	\$149.95
MCT-VGA	8.16 BIT VGA CARD	\$149.95
MCT-VGA-1024	1024 X 768 VGA	\$169.95
MCT-VGA-1024+	1024 X 768 256 COLORS	\$199.95

UPRIGHT CASE

\$249⁹⁵

• FOR STANDARD FULL-SIZE AND MINI MOTHERBOARDS
• 250 WATT POWER SUPPLY
• MOUNTS FOR 3 FLOPPY AND 4 HARD DRIVES
• TURBO AND RESET SWITCHES
• SPEED DISPLAY POWER DISK LEDS
• MOUNTING HARDWARE, FACEPLATES AND SPEAKER INCL.



CASE-100		\$249.95
----------	--	----------

MORE CASES...

CASE-200	UPRIGHT HOLDS 11 DRIVES	\$499.95
CASE-120	MINI UPRIGHT W/200 WATT PS	\$199.95
CASE-70	FULL-SIZE 286 STYLE CASE	\$89.95
CASE-50	MINI-SIZE 286 STYLE CASE	\$59.95

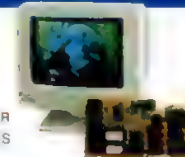
POWER SUPPLIES

PS-135	135 WATT FOR 8088	\$59.95
PS-150	150 WATT FOR 8088	\$69.95
PS-200X	200 WATT FOR 8088	\$89.95
PS-200	200 WATT FOR 286/386/486	\$89.95
PS-250	250 WATT FOR 286/386/486	\$129.95

VGA PACKAGE

\$499⁹⁵

• 640 X 480 IN 16 COLORS
• HIGH RES. ANALOG MONITOR
• EGA CGA MONO & HERCULES COMPATIBLE
• DRIVERS FOR WINDOWS, GEM, LOTUS 1.2.3, SYMPHONY, AUTOCAD & VENTURA



VGA-PKG		\$499.95
---------	--	----------

MORE MONITORS...

NEC-MULTI-3D	14" MULTISYNCH MONITOR	\$649.00
JDR-MULTI	14" MULTISYNCH MONITOR	\$429.95
CM-1140	SEIKO 14" MONITOR	\$599.00
VGA-MONITOR	VGA MONITOR	\$379.95
MONO-VGA	PAPERWHITE VGA MONITOR	\$139.95

2400 BAUD MODEM

\$89⁹⁵

• 2400-1200/300 BPS INTERNAL DATA MODEM • FULL HAYES AT COMPATIBILITY • INCLUDES PROCOMM SOFTWARE

MCT-24H		\$89.95
MCT-FAXM	AS ABOVE W/4800 BPS FAX SEND	\$119.95
PRO-96EF	9600 BPS EXTERNAL W/FULL FAX	\$679.00

BUY WITH CONFIDENCE FROM JDR!

- 30-DAY MONEY BACK GUARANTEE
- 1 YEAR WARRANTY
- TOLL-FREE TECH SUPPORT



\$599



1024 x 768 VGA PACKAGE

This bundled monitor and VGA card is a remarkable high resolution value!

RELISYS 9514 VGA MONITOR:

- Resolution up to 1024 x 768 (interlaced)
- 1:1 aspect ratio in 640 x 480 mode
- 0.28 dot pitch

MCT 1024 x 768 VGA CARD:

- 8/16 bit 8088 or 286/386/486 compatible
- 256 colors from a palette of 262,000
- 512K video RAM expandable to 1Mb
- Uses 414256-80 (256K x 4) DRAMs
- 132-column text mode
- Includes Windows 3.0 drivers

VGA-PKG-1024+	\$599.00
---------------	----------

800-538-5000

CALL FOR OUR FREE CATALOG!

FOR PC'S, MONITORS, DISK DRIVES, KEYBOARDS, INTERFACE CARDS, MODEMS, LAPTOPS, CABLES, CONNECTORS, SOFTWARE, PROGRAMMING PRODUCTS, TEST EQUIPMENT, ICS AND MORE!



Call toll-free and request our latest 100 page full color catalog. You'll find over 5000 PC-compatible products plus many useful "Tech Tips" written by our experienced Technical Support staff.

ETHERNET CARDS

• 100% NOVELL COMPATIBLE		
• FOR THICK OR THIN ETHERNET		
• 8 BIT OR 16 BIT VERSIONS		
DFINET-300	NE-1000 COMPATIBLE	\$159.95
DFINET-400	NE-2000 COMPATIBLE	\$109.95
RG58-6	6 FOOT ASSEMBLED COAX CABLE	\$5.95
RG58-12	12 FOOT ASSEMBLED COAX CABLE	\$8.95
RG58-100	100 FOOT ASSEMBLED CABLE	\$29.95
BNC-TERM-50	50 OHM DUMMY LOAD TERMINATOR	\$1.99

HARD DRIVES

ST-251-1	42.8 MB 5.25"	MFM	28MS	\$299.00
ST-157A	48.6 MB 3.5"	IDE	28MS	\$299.00
ST-277-1	65.5 MB 5.25"	RLL	28MS	\$349.00
ST-4096	80.2 MB 5.25"FH	MFM	28MS	\$569.00
ST-1201A	180 MB 3.5"	IDE	15MS	\$799.00
1654	161 MB 5.25"	ESDI	16MS	\$899.00
1664	345 MB 5.25"	ESDI	14MS	\$1449.00
1568	676 MB 5.25"FH	ESDI	16MS	\$2195.00

ASK ABOUT OUR KIT PRICES

FLOPPY DRIVES

FDD-1.44X	1.44MB 3.5" FLOPPY	BLACK	\$99.95
FDD-1.44A	1.44MB 3.5" FLOPPY	BEIGE	\$99.95
FD-55GFV	5.25" TEAC DOUBLE-SIDED HD 1.2MB		\$99.95
FDD-1.2	5.25" DOUBLE-SIDED HD 1.2MB		\$89.95
FD-55B	5.25" TEAC DOUBLE-SIDED DD 360K		\$89.95
FDD-360	5.25" DOUBLE-SIDED DD 360K		\$69.95



SALES 800-538-5000

Customer Service 800-538-5001 Local/Int'l 408-559-1200
Technical Support 800-538-5002 Fax 408-559-0250

TERMS: Minimum order \$10.00. Shipping & handling charges \$5.00 for ground and \$7.00 for air. Orders over 1 lb. and foreign orders may require additional shipping charges—contact our Sales Dept. for the amount. CA residents must include applicable sales tax. Prices subject to change without notice. We are not responsible for typographical errors. We reserve the right to limit quantities and to substitute manufacturers. All merchandise subject to prior sales. A full copy of our terms is available upon request. Items pictured may not be representative. JDR, the JDR logo, JDR Microdevices, and the JDR logo are registered trademarks of JDR MICRODEVICES, INC. Modular Circuit Technology, are trademarks of JDR MICRODEVICES, INC. Copyright 1991 JDR MICRODEVICES.

SPEED. GUARANTEED.



Here's a chance to buy our \$99 Math Coprocessor at no risk whatsoever! It's fully guaranteed to at least double the math performance of your software.

If you want to unlock the full power of your PC, pick up the phone and order an AMD 80C287 math coprocessor. Without it, your PC just isn't really complete. You see, our math coprocessor can *dramatically* increase the performance of 1-2-3,® dBASE,® Excel, and hundreds of your other favorite business applications! It actually runs calculations *two to ten times faster* than your PC can *without* a math coprocessor. Which means your graphs will draw incredibly fast and your spreadsheets will recalculate at truly blazing speeds. (And that's just for starters!)

High speed at a low price.

Don't think you have to pay over \$200 for a math coprocessor. Now you can get ours for just \$99 when you order direct from AMD! The AMD 80C287 is fully compatible with your 80286-based PC and the hundreds of commercially available software packages written for it. Our coprocessor is also compatible with the Intel NMOS 80287.

Installation is a snap.

The AMD 80C287 plugs easily into a socket that's already inside your 80286-based PC. In fact, you can be up and running in just five minutes. Simply plug the chip into the socket and watch the dazzling improvement in performance! The AMD 80C287 comes with easy-to-follow installation instructions, a free utilities disk (which includes diagnostics and test software), and free color computer games.

Advanced Micro Devices, Inc. 

9020-11 Capital of Texas Hwy N., Suite 400
Austin, TX 78759-9797

Volume or dealer inquiries welcome. 1-2-3 is a registered trademark of Lotus Development Corporation. dBASE is a trademark of Ashton-Tate Corporation. Intel is a registered trademark of Intel Corporation.
CIRCLE 197 ON READER SERVICE CARD

Our Triple Guarantee

Guarantee #1: If the AMD 80C287 doesn't do everything we promise, or if you are unsatisfied for any reason, return the product within 30 days of purchase and AMD will happily refund your money.

Guarantee #2: If your AMD 80C287 Math Coprocessor ever fails to perform for any reason, AMD will replace it free of charge, no questions asked. Limited to two lifetime replacements per person.

Guarantee #3: AMD guarantees that the AMD 80C287 is fully compatible with your 80286-based hardware and software. If you have any compatibility problems with the AMD 80C287 during the first year, return the product and we will gladly refund the purchase price.

To Order Call Now

1-800-888-5590 ext. 2400

Outside of USA call (512) 345-1728



Yes. I want to double or triple the calculation speed of software running on my 286-based PC. Send me an AMD 80C287 Math Coprocessor, risk free, for only \$99 plus tax, shipping and handling. I understand that I can return the AMD 80C287 for a full refund within the first 30 days if I am not completely satisfied.

NAME _____

ADDRESS _____

CITY/STATE/ZIP _____

Visa/MC# _____

Type of PC _____

714 • 272-0500



ALR Venture 386SX 20MB	2499
ALR 386SX 20MB	2299

ALR Venture 386SX 20MB	2499
ALTIMA NSX 386SX/20MB	2849
AST 286 20/40MB	2179/2479
386SX 20/40MB	2579/2879
EVEREX 386SX/20MB	2079
LEADING EDGE 386SX Plus	CALL
MITSUBISHI	
MP286L 20MB EGA	1699/2199
2400 Modem+ Case+ MS Works	Add 200
NEC UltraLite 286V/20MB/40MB	CALL
386SX 40/100MB	2849/3499
PANASONIC CF-170/CF-270	1369/1899
POQET PC 8088:under 1lb	CALL
SHARP PC 6220-20MB 1/2MB	2449/2599
TEXAS INSTRUMENTS	
TM2000 286/20MB:1/2/3MB	2299/2449/2599
TM3000 386SX 40/60MB	3669/3969
TOSHIBA T1000SE:1MB/3MB	999/1249/1499
T1000XE:1MB/3MB	1299/1549
T1000LE-20MB:1/3/5MB	1679/1929/2179
T1200XE:1MB/3MB	2169/2299
T2000SX-20MB 1/3/5MB	3349/3599/3849
T2000SX-40MB:1/3/5MB	3649/3899/4149
T3100SX-80MB/1/3MB	3969/4099
T3200SX-40MB/1/3MB	3369/3499
T3200SX-120MB/1/3MB	3969/4099
T5200-100/200MB	5199/5699

• FREE SHIPPING •

PREPAID orders only (by check) with UPS Ground to 48 contiguous states. Some heavy items such as monitors & printers may not be free. Allow 2-3 weeks for personal & company checks. Cashier check orders shipped immediately.

REFER AD#PC 732

MEMORY UPGRADES

COMPAQ	
SLT 286 1MB/4MB	165/595
LTE 286 1MB/2MB	139/166
HEWLETT PACKARD	CALL
LEADING EDGE LT 386SX 1MB	125
MITSUBISHI 286 Laptop 2MB	350
NEC PS286/386SX/1/4MB	209/495
SHARP P6220-1MB	175
TEXAS INST TM2000 1MB	190
TOSHIBA T1000.768k Card	245
T1000SE/XE/LE 2MB	275
T3100SX 2MB ea/4MB ea	149/395
T3200SX 2MB ea/4MB ea	149/395
T5200 2MB ea/8MB ea	149/795

EDITORS

NEC 2A / 3D	449-5999
4D/5D	979-2199
PRINCETON GRAPHICS	
Ultra 12"/14"/16"	479-529-8599
SEIKO 1440/1450	519-6399
SONY 1304	644-4444
VGA 9 to 15 Pin Connector	201-261-1111

• DISPLAY CARDS •

ATI VGA Wonder Plus w/512k	235
HERCULES Graphics Stn I/II 629/923	
NEC Graphics Eng16/256	599/899
NUMBER 9 Graphic Xcse Lvl 1	599
G X: Level 2-5 XT/PS2	CALL
ORCHID ProDesigner II:1MB	325
SIGMA DESIGNS	
VGA Legend 1MB	349
VIDEO-7 VGA 1024i.512k	229
V RAM VGA 512k	349

WATKINS

SIMMS/SIPPS	CALL
CYRIX 83087-16/20 ..	259/288
83087 25/33	359/439
INTEL 80287 XL/80C287A	195/279
80387SX 16/20 ..	209/309
80387DX: 16:20 ..	329/359
80387DX.25.33	479/559

• MODEMS •

EVEREX 2400 MNP5 Int/Ext	159/199
EXCEL 2400 Int/Ext	75/95
INTEL 2400 MNP5 Int/Ext	189/229
9600 V42 Ext w/SW	499
MEGAHERTZ 2400 Int w/software	
Compac LTE/SLT	159/165
Toshiba In slot/No slot	139/135
NEC ProSpeed	149
Zenith 181,183,SP,SP286	149
MITSUBISHI LP 2400 Int	149
PRACTICAL PERIPHERALS	
2400 Mini Pocket	129
2400 MNP5 Int/Ext	169/199
PROMETHEUS	
9600 MNP5 V32 Ext	649
2400 MNP5 Int/Ext	179/199
TELEBIT	CALL
TOSHIBA 1200 Int T1000	65
2400 In slot/No slot	219/249
US Robotics	
Courier 2400 MNP5 Int/Ext	279/315
HST 14.4 V42bis: Int/Ext	499/535
9600 V32 MNP5 Int/Ext	519/569
HST V42 Dual Std Int/Ext	759/799
WORLD PORT 2400 Portable	239
2400 MNP5 Portable	339
ZOOM 2400 Int/Ext	89/99
2400S Int w/SendFax	99

• NETWORKING •

DCA/IRMA Full Line **CALL**
STD MICRO Arnet Hub Act/Pass 299/79
SYNOPTICS Full Line **CALL**
TIARA Arnet Hub: Act/Pass .. **CALL/49**
Arnet Lncard A: 8 bit/16 bit .. **89/249**
Ethernet Lncard E: 8 bit/16 bit **189/329**
WESTERN DIGITAL Ethercard plus
8 bit with 8k / 32k **179/199**
16 bit / 16 bit MCA **249/279**
XIRCOM Pocket Adapters **CALL**

• ORDER BY MODEM •

24HRS • 714/734-2617

BACKUP DRIVES

ARCHIVE	
40MB XL w/tape Int/Ext	259/369
80MB XL w/tape Int/Ext	375/485
COLORADO JUMBO Backup	
120MB w/tape Int/Ext	269/379
250MB w/tape Int/Ext	349/459
MOUNTAIN 152MB w/Mach II In	
649	
EXTERNAL FLOPPY & Controller	
FOR PC/XT/AT/386	
3 5": 1.44MB	189
5 25": 1.2MB	195
FLOPPY 5.25" EXT 360K / 1.2MB	
IBM PS/2, Most Models	179
COMPAQ LTE/SLT	179/185
MITSUBISHI 286L	179
NEC ProSpd 286/386SX	179
TOSHIBA, Most Models	179
ZENITH SupersPort/286	179
HARD DRIVES: EXTERNAL	
Portable 200MB under 1lb	599
40/100/200MB	529/799/1599
PLUS HC II XL 50MB/105MB	365/629

SCANNERS

CHINNON DS 3000	545
DS 3000 w/OCR SW ReadRight	695
COMPLETE PC Full page	499
DEST Personal Scan w/OCR	679
PC 3000 Solution Pac	1499
HP ScanJet Plus: Specify I/F	1399
ScanMen+ XT/AT/PS2	189
ScanMan Plus: PS2 50 & up	249
MICROTEK 300G XT or PS2	1199
300Z Color/GS XT/PS2	1699
SHARP IX 100 IX 200	CAL

PRINTERS

CANON BJ100	329
DICONIX 150 PLUS Parallel	329
With 3.6' or 10' cable	345
HEWLETT PACKARD DeskJet 500	479
PaintJet PaintJet XL	1069/1849
HP IIIP/III/IV/IIID/IIID	CALL
OKIDATA	CALL
TEXAS INSTRUMENTS PS17	1395



DESKTOPS

CALL FOR EXACT CONFIGURATIONS

ALR 286/386SX	NEW 100
Business VEISA 386/33	1779
AST Bravo 286/386SX	749/154
Premium 386 25/33	3249/398
Premium 486 25/33	5199/629
EVEREX Tempo 386SX/16	95
Tempo 386 20/25	1299/142
GOLDSTAR 286/12	67
386SX 16/20	919/105

• **FAX, etc.** •

AUDIOVOX 110/220 volt 50/60 Hz

1000/2000/3000	379/429/529
PANAFAX UF170	89
SAMSUNG 1010/1100	399/429
SHARP	CAL
COMBO Modem & Fax Card	15
COMPLETE PC Fax 9600 Int/Port	289/299
Complete Communicator: Modem, Fax & Voice Mail System	399
EVEREX 2496. Int/Ext	259/329
FRECOM Fax96	16
INTEL SatisFAXion 9624	38
WORLD PORT 2496 Portable	43
Toshiba No slot In slot	399/449

• FOREIGN ORDERS •

**FAST and reliable Door to Door fully insured. Most countries
3-5 days service Low shipment charges. Major Credit Cards
accepted Fax 714 272 9397**

SUNDAY 10-5

NEC

TOSHIBA

EPSON

HP

HEWLETT PACKARD

PROMPT DELIVERY

COMPUTERS

ALR
Power Flex 386 SX 16 MH 1794 99

Business Voice MOD 101
1794 99

Business Voice MOD 101
2349 99

Business Voice MOD 101
3874 99

Apple
CALL
2694 99

Canon
CALL

Packard Bell 386 SX
1594 99

FACSIMILE (FAX)
220V Fax Available

HAND SCANNERS
CALL

MODEMS
CALL

ALTIMA
2349 99

AST Premium Exec
CALL

COMPAQ LTE & SLT
2324 99

EVEREX
Notebook
CALL

PANASONIC
CALL

THE POUQUET PC
CALL

TEXAS INSTRUMENT
CALL

TOSHIBA
CALL

PRINTERS F/LAPTOP
CALL

LAPTOP ACCESSORIES
CALL

LASER PRINTERS
CALL

Howlett Packard
CALL

Okidata
CALL

Panasonic
CALL

LASER ACCESSORIES
CALL

PRINTERS
CALL

MONITORS
CALL

SEA-GATE H/D
CALL

NETWORKING
CALL

SON
CALL

NOVELL
CALL

FLATBED SCANNERS
CALL

IN USA & CANADA & P.R.

INCLUDING NY STATE

1-800-874-1235

S & W COMPUTERS & ELECTRONICS

31 West 21 Street, New York, NY 10010

NYC (212) 463-8330

**Hours: Sun. 10-5
Mon. Thurs. 9-6 Fri. 9-7:45
Saturday Closed**

PRICES HARD TO MEET — SERVICE HARD TO BEAT! World Wide Inquiries Promptly Filled



GET NONSTOP SYSTEMS INFORMATION — AND 2 DISKS FREE!

PC MAGAZINE is the one publication you can trust to keep you up-to-date on the latest developments in the ever-changing world of computing.

Subscribe now to make sure you don't miss a single product report or productivity-enhancing tip.

- One year (22 issues) for \$29.97.
SAVE 54%.**
- Two years (44 issues) for \$49.97.
SAVE 62%.**

And if you order now, you'll also get our exclusive 2-DISK "BEST OF PC MAGAZINE'S UTILITIES"—FREE with your paid subscription!

Don't delay. Call toll-free today to claim your savings and FREE "BEST OF PC MAGAZINE'S UTILITIES!"

1-800-289-0429

Please add \$32 per year for postage outside the U.S., U.S. currency only. Canadian GST included. Please allow 30 days for delivery. Disks will be shipped upon payment.

Paradise

ORDER TOLL FREE: U.S. & Canada - 1 800 348-4PCP (4727)

Japan - 0031-11-1865

Australia - 0014-800-126-943

In Hawaii - (808) 875-1100

FAX - 1 (808) 875-0061

Shipping & Technical Assistance - 1 (808) 875-1108

COMPUTERS

IBM PS/2	
Laptop	Call
PS/2 Mod 30-286 30 Mb	1685
PS/2 Mod 50Z 30Mb/60 Mb	1650/1790
PS/2 Mod 55SX 30/60 Mb	2415/2600
PS/2 Mod 65SX 60/120 Mb	3550/3725
PS/2 Mod 70 60/120/A21	
	2915/3786/4800
PS/2 Mod 90/95-486	Call
PS/2 Mod 75	Call

COMPAQ	
LTE 286 20/40 Mb	2420/2750
LTE 386 SX 30/60	4575/4924
SLT 386 60 Mb	4722
DPro 386S 20 Mod 1/40 Mb	1990/2259
DPro 386E 40/110 Mb	3485/3756
DPro 386/25E (All Models)	Call
DPro 386/33 84 Mb	7299

AST	
Executive 286/386	2125/2582
Premium 286 512k	1047
Premium 386 16/25/33	Call
Premium 486	Call

TOSHIBA	
T1000 SE/XE/LE	956/1376/1599
T1200 XE	1970
T1600 40 Mb	2490
T3100 SX 40/80 Mb	3744/4241
T3200 SX 40/120 Mb	3866/Call
T3200 SX Color	6395
T5100 100 Mb	3293
T5200 40/100/200/Color	
	4488/4865/5302/5924

DFI	
286-12 Mhz	539
386-16 Mhz	839
386 SX-20 Mhz	965
386-25 Mhz	1215
386-33 Mhz	1590
486-25 Mhz	3039

1-year on-site warranty
... Call for Custom Configurations

PANASONIC	
170/270	1439/1939

MONITORS & TERMINALS

MONO/COLOR	
IBM 8503 3512	227/459
Packard Bell 1474	96
Samsung 12"	85
Samsung RGB	200

VGA EGAMONITORS	
IBM 8506 07 08	899 629 929
IBM 8513 14 15	525 1150 719
Mitsubishi 1381 HL6915	485 1950
NEC 2A/3D	475/593

NEC 4D/5D	969/2265
Packard Bell 8531/8541	275/290
Panasonic 1381/1391	429/499
Samsung VGA/4581/4592	
	344/430/309
Zenith 1492	595

VIDEO BOARDS

ATI VGA Wonder 256/512+	199/240
Everex EGA/VGA	89/117
Hercules GB 1024/1024+2	659/959
Orchid ProDesigner	329
Paradise VGA+16/VGA1024	
	122/145/175
Color/Mono/w Parallel Card	45
VGA 1024 256/512	124/149

PRINTERS

CANON	
BJ10E	335
CITIZEN	
120D/GSX140	135/295
HSP500/550	301/421
DICONIX 150	
P/S	343/347
HEWLETT-PACKARD	
Laserjet 3/3D	1589/2399
Laserjet 2P	899
Deskjet 500	489
Scanjet +	1069
PaintJet/XL	955/1680

FONTS & MEMORY	
Pacific Data 25-1	278
Pacific Data 1/2/4 Mb	129/169/265
Pacific Connect Laser Share	299
Pacific Page IIP/III	349
Pacific Data Plotter in a Cig	225
Laserjet Memory 1/2/4 Mb	119/159/245
Compaq 1/4 Mb Modules	118/383
IBM/Toshiba Memory	Call
CPI Jet Page/Superset 425+	299/259

IBM	
4019 E/4019 Laser	1089/1595
Proprinter XL24E/X24E	Call

NEC	
P-3200	276
6200/6300	476/645
Silent Writer 290	2450
Silent Writer 2 Mod 90	1595

OKIDATA	
ML 182	228
ML 320 321	324 451
ML 380	289
ML 390+ 391+	449 613
ML 393+ 393+ color	968 1055
OkiLaser 400/800	639/965
OkiLaser 820/840	1276 1949

Quality at the best prices under the sun.

Specializing in International Orders



PANASONIC	
1124	275
1624/1695	390/410
1180/1191	149/229
4420/4450/4455	869/1244/2099

TERMINALS

Wyse 50/60	375/300
Wyse 30/85	310/339
Wyse 150/185	289/379

SOFTWARE

Aldus Pagemaker 4.0	525
Ashton Tate dBase III+ / IV	319/479
Borland Quattro Pro 2.0	295
Carbon Copy	105
Clarion Prof. Developer	450
Harvard Graphics 2.3	289
IBM Displaywrite 5.0	229
IBM OS/2 Std/Ext 1.1	275/575
Lotus 1-2-3 2.2/3.1	349/399
Microsoft	All Titles-Lowest Price
Microsoft Windows 3.0	90
Norton Adv. Util 5.0	110
Procomm Plus	61
Quicken 4.0	39
Ventura 3.0/Gold	529/539
WordPerfect 5.1	245

400 Additional Titles In Stock

PLOTTERS AND DIGITIZERS

HEWLETT-PACKARD	
7475A/7550A	1349/2645
7570A/7575A	2699/3343
7576EXL	4399

SUMMAGRAPHICS	
Summasketch 2 12X12/12X18	
	335/565

CALCOMP	
1023/25	3250/4030
12X12/12X18	275/497

MULTIFUNCTION BOARDS/CARDS/CHIPS

IBM 5250 Emulation	675
AST 5251 Emulation	489
AST 6-Pack w/384 k	145
Intel AboveBoard	265
Intel InBoard PC	492
Cyrix Fasmath	Call
80287-XL	199
80387-SX 16/20/25/33	
	290/320/378/462/562

MODEMS & COMMUNICATIONS

ATI 9600 ETC	484
---------------------	-----

CPI 2400 Internal	86
CPI 2400 Ext Fax	123
CPI 2400 Ext MNP	154
Everex 2400i/2400e	105/164
Hayes 2400/2400B	319/218
Hayes 2400 PS2/9600	321/743
Hayes Ultra 96	785
Pocket Modem	99
Intel 2400/9600	217/499
MegaHertz 2400 Internal	141
Practical Perif 2400/9600	132/Call
US Robotics HST/Dual	585/809

FAX MACHINES

Sharp FO 216/240/334	538/649/699
Intel Satisfaction	385
JT Fax 9600	525

MICE

DFI 200/400	32/42
Logitech C9/Bus/PS2	82
Logitech Scanman PC/PS2	169/240
Microsoft Mice/+ Windows 3.0	
	103/145

DRIVES & TAPES

ST 225/238	189/192
ST 157A/251-1	229/239
ST 1126A/1144A/1239A	449/630/795
ST 4096/4182E	530/925
Plus II XL50/105	388/638
Everex 40/60Mb Tape	250/650
Irwin 40Mb Tape	390
Toshiba External 3.5/5.25"	Lowest
Panasonic LF5010 Worm	2056
Procom Ext 5.25	290
Procom Ext PS2 Hard Drives	Call

NETWORK

Call us For The Best Prices Anywhere

MISC & ACCESSORIES

Keytronics KB101+	89
Kensington Masterpiece/Plus	85/95
AB Switch Box	27
TrippLite 450/1200/2000	
	296/618/1175
4 outlet surge	39

**Win
A Free
Hawaii Vacation!**

All orders shipped insured next or second day air via **FEDERAL EXPRESS**/24-hour worldwide order tracking / Printer Orders received by 9 PM CST can be shipped same day / All credit card and COD orders checked electronically / We accept Amex, Visa, MC, JCB, Discover, Diners Club, COD's, Wire Transfer, Letter of Credit, **TERMS & LEASE AVAILABLE** (one day approval) / Credit cards not charged until product shipped **GOVERNMENT AND EDUCATIONAL P.O.'S ARE WELCOME** / Allow 10 days for personal checks to clear / Prices reflect a 3 per cent cash discount / Non-defective returns subject to a restocking charge / All warranties good through Paradise Computer Products / Prices subject to change without notice.

HOURS: 8:30 AM TO 8:30 PM CST MON-FRI, 10 AM TO 4 PM CST, SAT.

Paradise Computer Products Ltd. P.O. Box 890553 Dallas, TX 75389-0553

CIRCLE 145 ON READER SERVICE CARD



- Manufacturer direct memory upgrades - low pricing
- Technical Sales - upgrade assistance
- Factory (five year) warranty
- 1 stop source for all PC memory upgrades

MEMORY SHOPPER

CALL TOLL FREE
1-800 255 8607
for latest pricing

SIMMS

256K x 8 - 12	10	64K x 1 - 12	160
256K x 8 - 10	12	64K x 1 - 10	145
256K x 8 - 08	15		
256K x 8 - 12	13	256K x 1 - 12	165
256K x 8 - 10	15	256K x 1 - 10	185
256K x 8 - 08	18	256K x 1 - 08	195
1M x 8 - 10	30	64K x 4 - 10	185
1M x 8 - 08	43	64K x 4 - 08	195
1M x 8 - 10	47	1M x 1 - 12	445
1M x 8 - 08	49	1M x 1 - 10	475
1M x 8 - 07	54	1M x 1 - 08	495
4M x 8 - 08	230	1M x 1 - 70	525
4M x 8 - 08	250	256K x 4 - 10	475
		256K x 4 - 08	495
		1M x 4 - 80	Call
		4M x 1 - 80	Call

Call for SIP (Leaded) pricing and Nibble/Static column modules PMP also produce SRAM modules Call for details

DRAMS are available in DIP, Surface mount & ZIP packages Call for EPROM, SRAM & LOGIC prices

CO PROCESSORS

8087	8088	8089	8090
8087	\$75	\$108	\$153
8088	\$118	\$179	\$261
8089	\$171	\$184	\$224
8090	\$171	\$184	\$224
8090	\$171	\$184	\$224
8090	\$171	\$184	\$224
8090	\$171	\$184	\$224
8090	\$171	\$184	\$224
8090	\$171	\$184	\$224
8090	\$171	\$184	\$224

COMPAQ MEMORY

DeskPro 286E, 386/20/20E/25/S16	
1MB Add on module	\$ 95
4MB Add on module	\$329
1MB Exp Bd (20E 25S only)	\$155
4MB Exp Bd (20E 25S only)	\$388
DeskPro 286N 386N/SX/20	
1MB SIMM	\$ 85
2MB SIMM (not 286N)	\$139
4MB SIMM	\$395
Call for expansion cards for 286/386N	
DeskPro 386/33, 486/25/33 and SystemPro	
2MB Bd	\$ 195
8MB Bd	\$ 990
32MB Dual Bd	\$6550
DeskPro 386/16	
1MB Kd	\$ 148
1MB Bd	\$ 275
2MB Bd	\$ 422
4MB Bd	\$ 655
8MB Bd	\$1140

Portable 386 SPECIAL COMPLETE KIT Upgrade from 1MB to 10MB \$1349.00 Limited Qty So Call For Details

LTE/286	
1MB	\$120
2MB	\$190
4MB	\$712
LTE/386	
4MB	\$1140
SLT/286	
1MB	\$170
4MB	\$715
SLT/386	
1MB	\$185
2MB	\$320
4MB	\$715

Call for upgrades on Portable II & III

HP LASERJET & VECTRA MEMORY

HP Laserjet II/IIi/IIp/IIx/IIId	
1MB	\$ 90
2MB	\$139
4MB	\$218
Call for OKI, Panasonic, Epson, IBM & Canon Laser Memory Upgrades	
Vectra QS-20, RS-25, 20C, QS-16, ES-12	
1MB Kd	\$99
2MB Kd (QS-16 only)	\$159
4MB Kd	\$315
Vectra 386/25 PC, 486PC	
1MB	\$86
2MB	\$139
4MB	\$379
8MB	\$990

IBM PS/2 MEMORY

Model 30/286	
512KB	\$ 48
2MB	\$155
Model 70 E61/121, 50x, 55SX, 65SX, 70A21	
1MB (not 70A21)	\$ 85
2MB	\$139
4MB (only 55/65SX Boards)	\$395
Model 80	
1MB (80-141)	\$125
2MB (80-111/311)	\$215
4MB (80-A21/A31)	\$515

CALL ON
MODEL 95 MEMORY

IBM EXPANSION BOARDS SPECIALS

16 Bit At Compatible 2 to 8 MB Board	
Extended, Expanded & or Backfill	
Memory Supports DOS/IMEMS	
40 Runs Lotus 1-2-3, Windows & More	
299.00 w/2 MB	
USES STANDARD SIMM MEMORY MODULES	

HP FONT CARTRIDGES

Standard - A thru Z	\$99
T25 - 150 Fonts	\$299
Postscript for HP II, HP III	\$349
Best selling Postscript emulation cartridge	
Our fonts are 100% compatible with HP	
Many different types available Call for Help	

ZENITH

Turbosport 386e	
1MB	\$195
4MB	\$475
SuperSport SX (Alpha/Beta/286/286E)	
2MB	\$260
Z386/20/25/33/33E	
1MB	\$ 90
2MB (not 33E)	\$155
4MB	\$390

TOSHIBA MEMORY

T1000 SE/XE	
1MB	\$250
2MB	\$335
T1200XE, T1600, T3100E/SX, T3200SX	
T5100 T5200	
2MB	\$185
4MB	\$450
Call for 8MB upgrades	

16 Bit For IBM PS/2 Models 50/50Z/55SX/60/65SX

Models 50/50Z/55SX/60/65SX			
MICRO-CHANNEL			
2 to 12 MB Board			
2 Meg	420.00	4 Meg	520.00
6 Meg	620.00	8 Meg	720.00
10 Meg	820.00	12 Meg	920.00

32 Bit For IBM PS/2 Models 70/80

32 Bit For IBM PS/2 Models 70/80			
<u>MICRO-CHANNEL</u>			
2 to 8 MB Board			
2 Meg	459.00	4 Meg	569.00
6 Meg	679.00	8 Meg	789.00
IBM Equip. P/N 6450605			

AST MEMORY

premium W/286/386SX	
Bravo/286/386SX	
12MB Kd	\$ 55
2MB Kd	\$108
premium 386/C/16	
1MB Kd	\$ 95
4MB Kd	\$349
premium 386/33/SX-16, 486/25T/33	
1MB	\$80
premium 386/SX20/SX16	
1MB	\$ 90
4MB	\$535
premium 386/33T, 486/25	
8MB	\$975
premium 486 2MB	\$184
Full range of upgrades for AST available	

PERFORMANCE MEMORY PRODUCTS
6354-B Corte Del Abeto,
Carlsbad, CA 92209
Telephone: 619 931 7824
Fax: 619 931 6557

PERFORMANCE MEMORY PRODUCTS
With 8 years' design and manufacturing experience, PMP offers factory direct pricing and immediate stock with knowledgeable technical assistance. All product is guaranteed 100% compatible or full money back promise.
*Call if the upgrade you require is not advertised.

Upgrades for: Apollo, AST, AT&T, Compaq, Canon, Commodore, Dell DEC, Everex, Epson, HP, IBM PC, XT, AT, PS/2, Intel, Mitsubishi, NEC, Olivetti, Packard Dell, Panasonic, Sharp, Sun, Toshiba, Tandy, TI, Wyse, Zenith and many more.

- No surcharge for credit cards
- Immediate availability (UPS/Fed Express)
- Call for volume trade and Govt and educational enquiries
- Pricing subject to change 20% restocking charge for non defective returns
- All brand names mentioned are trade marked by their respective holders
- INTERNATIONAL ORDERS WELCOMED
- Call for ALL Laptop Memory



CIRCLE 343 ON READER SERVICE CARD

Memory & Hard Drives

If you don't see everything you want, PLEASE CALL us.
New Lowest Prices! 5 Year Memory Warranty! Best Brands!

TOSHIBA T1000SE/XE	2MB \$299	H-P LASERJET II, IID, IIP, III, and IIId	
T1000SE, T1200SE, T1600SE	2MB \$179	Any memory board compatible with HP	1MB \$99
T1000, T5200, T8500	3MB \$239	compatible and expandable up	2MB \$149
NEC Prospeed 286, 386SX	2MB \$159	to 4MB by adding chips	4MB \$249
ZENITH Supersport 286E/SX	1MB \$159	NEW 25-pin Font Cartridge, fits all	\$249
Best selling mem. boards, 80ns chips		IBM Laser Printer memory upgrades	Please Call
BocRAM AT Plus, 16-bit	2MB \$229, 4MB \$374		
BocRAM XT, easy plug in	1MB \$159, 2MB \$212		
COMPAQ fully compatible memory			
286E 386/20 25 20e 25e 386s modules			
1MB \$99 4MB \$319			
386/33 486/25 System Pro mod	2MB \$189		
386/33 486/25 System Pro mod	4MB \$319		
386/33 486/25 System Pro mod	1MB \$139		
386/33 486/25 System Pro mod	1MB \$179		
386/33 486/25 System Pro mod	2MB \$289		
386/33 486/25 System Pro mod	1MB \$119 2MB \$179		

W-D IDE "Pirahna" AP4200 Hard Drive: 14ms access, 64K Cache- \$949
Western Digital 93044-A, 40MB, 29ms, IDE \$279
NE WA Kwik KL343, 42MB, 30ms, IDE \$249
Seagate ST277R 1, 65MB, 28ms, RLL \$289
Conner CP3104 104MB, 25ms, IDE \$499

FREE! Know your supplier! We have \$millions in inventory and 350,000 satisfied customers over our 9 years. Please call for your big, free TENEX catalog today.

TENEX
Computer Express

56800 Magnetic Drive
Mishawaka, IN 46545

No fee for V/MC/DC
U.S. Shipping handling \$5.00
P.O. & dealers welcome
Price and availability may vary

Toll Free 1-800-776-6781
Nationwide International 219-259-7051 - FAX 219-259-0300

PZY

CIRCLE 306 ON READER SERVICE CARD

What Kills More
Americans Each Year
Than Cocaine,
Heroin, Suicide,
Alcohol Abuse,
Auto Accidents
And Homicide
Combined?
Lung Disease.
Including Lung Cancer.

It's a matter of life and breath.[®]
AMERICAN LUNG ASSOCIATION[®]
The Christmas Seal People[®]

Space contributed by the publisher as a public service.



If You're Not Buying From **Bulldog** — You're Barking Up The Wrong Tree!

BULLDOG SYSTEMS

286 12 MHz	
1 mg Ram, 1.2 floppy	\$599
286 16 MHz	
1 mg Ram, 1.2 floppy	749
286 20 MHz	
1 mg Ram, 1.2 floppy	819
386 20 MHz	
1 mg Ram, 1.2 floppy	1155
386 25 MHz	
1 mg Ram, 1.2 floppy	1215
386 25 CACHE	
4 mg Ram, 1.2 floppy	1895
386 33 CACHE	
4 mg Ram, 1.2 floppy	2250
486-25 CACHE	
4 mg Ram, 1.2 floppy	3199

FREE shipping on all **BULLDOG** systems prepaid with a Cashiers Check, Money Order or Bank Wire!

LEADING EDGE SYSTEMS

D3/SX — 80386SX/16 MHz,	
1 mg Ram, 1.2, 52 mg hard drive,	
VGA video controller	1349
D2/LPS — 80286 12 MHz,	
1 mg Ram, 1.44, 40 mg hard drive,	
VGA on motherboard	869

AST SYSTEMS

AST Premium 286 Model 70	1075
AST Premium 386 Model 300C	2879

LAPTOPS

<i>You can take these lightly!</i>	
Leading Edge DLT/386 Plus —	
80386SX—16 MHz, 2 mg Ram, 144,	
40 mg hard drive, Supertwist	
LCD screen	1995
Panasonic CF170 Notebook	1389
Panasonic CF270 Notebook	1869
Atari Portfolio Palmtop	249

Call for Pricing on Toshiba Laptops!

MACINTOSH CORNER

Adobe Illustrator	345
Aldus Pagemaker V4.0	495
Color Set	205
Filemaker Pro	205
Foxbase + V2.0	299
Mac Draft	175
Mac Draw	250
Mac Write II	122
Microsoft Excel	250
Microsoft Word	250
ORG Plus	125
Studio 32	492
Swivel 3D V1.2	320
WordPerfect V1.03	220
Datashow 480	1245
Mac Sync	425
Impulse 42	335
Impulse 84	495
Impulse 168	799
Epson ES300C Color Scanner	
w/Macintosh Interface	1599

PRINTERS

EPSON	
LX 810	\$173
FX 850 1050	289 399
LQ 510/850	259 435
LQ 1010/1050	369 599
LQ 2550	849
EPL 7000	799
LQ 860	549
Epson ES300C Color Scanner	
w/ES300 Dos Interface	1450
DICONIX	
Diconix 150+	345
SEIKO	
Smart Label	189
OKIDATA	
172	199
182 Turbo	229
320/321	319/449
380	285
390 Plus/391 Plus	449/605
393 Plus/393 Color Plus	955/1069
OKI LASER	
840 820	2039/1359
800 400	1020/655
TOSHIBA	
Express 420 440	319/449
NEC	
P3200 P3300	295/419
P3000	969
2000 XE	249
6200/6300	479/639
Silent Writer II 90	1659
PANASONIC	
1124/1180	279/149
1191	229
1624/1695	359/389
4420	779
4450/4455	1199/1999
HEWLETT PACKARD	
Laser Series III	1599
Laser III D	2425
Laser II P	899
Desk Jet 500	525
LASER ACCESSORIES	
Pacific Data 1 mb/2mb	109/149
Pacific Data 25 N-1	259
Pacific Bar Code	315
Pacific Outlines	189
Pacific Page PE	339
Pacific Print	229
Headlines in a Cartridge	219
Pacific Connect 256K	249
Complete Font Library	249
Super Set Plus 425	265
CANON	
LB P11	955
LBP 8 III	1799
BJ 10E	339

MODEMS & FAX

<i>The Great Communicators!</i>	
Adtech Micro Systems	
Datamax MNP 9600 bps send/rec	
w/2400 bps Internal MNP5 Modem	199
Externally Yours MNP	235
Smart Connect 24i MNP	75
TeleShare Fax Switch	\$129
Everex 1200 int	69
Everex 2400 int /ext	85/169
Everex 2400 ext. w/mnp	199
Hayes 1200B/2400B w/Smartcom	199 289
Hayes 1200/2400	279 329
Megahertz 24 for Zenith	139
Megahertz 24 for Toshiba	149
Practical Per 2400 int	127
Practical Per Pocket Modem	105
US Robotics 2400/9600	139 575
ViVa 24 int /ext	79 110
Cardinal 2450 int. w/Flashlink	79
Cardinal 2400 ext	99
Cardinal 2450 int. w/MNP	129
Cardinal 2400 ext. w/MNP	139
Cardinal 2250 F Sendfax	110
Cardinal 9650 V 32 int. w/MNP	459
Call! Fax	Call!
Toshiba 3450/3750	610/679
Toshiba 4400	487
Epson 3000	625
Everex 24/96 int /ext	\$249 319

GRAPHIC CARDS

Boca Basic VGA	\$69
Boca Super VGA	135
DFI Mono/Color	39
Everex Micro Enhancer	59
Everex Viewpoint VGA 256/512	142/179
Genoa Super Hi Res	145
Genoa 6300/Genoa 6400	199 239
Hercules Graphics Card	179
Hercules InColor	179
Hercules VGA	119
Orchid Pro Designer/e	189
Orchid Pro Designer II w/512K	279
Paradise VGA Plus	135
Paradise VGA Plus 16	169
Paradise 1024 w 512K	229
Vega VGA	139
V Ram w. 512K	349
Video 7 VGA 1024/256K/512K	169 219
ATI VGA w/256K/512K	209 259
NEC Graphics Engine 256K	899
Cardinal VGA 100/200	79 89
Cardinal VGA 300 400	99
Cardinal VGA 500 600	125 129
Cardinal VGA 700 w/512K	139

TAPE DRIVES

Everex Excel 60F	245
Everex 60 mb int./ext. Teac	595/699
Everex 60 mb int./ext. Wangtech	679/789
Archive 40 mb int./ext	249 409
Archives FT 60 int. or ext. w/card	589
COLORADO MEMORY SYSTEMS	Call!

NETWORK

<i>Call for the best pricing on all your networking needs!</i>	
Advanced Network	1859
ARC Net PC 130/130E	99/129
ARC Net Active Hub/Passive Hub	289/79
ARC Net PC 500FS/500WS	305/235
Lantronic 2mb Starter Kit/Adapter	389/179
Lantronic 10mb Ethernet	
Starter Kit/Adapter	519/249
Level I/Level II	439/1059
NE1000/NE2000	155/189
SFT	2639
Western Digital Ethernet Plus	179
Gateway, 3 Com, Thomas Conrad and	
Western Digital	Call for Price!

DRIVES

Conner 40/110	249/495
Seagate 20mb w/contr ST225	239
Seagate 30mb w/contr ST238	249
Seagate 40mb for AT ST251-1	249
Seagate 80mb ST 4096	469
Ext Drives for PS/2 360/1.2	169/199
Toshiba 3-1/2" 1.44mb int	79
Toshiba 5-1/4" 360K int	75
Toshiba 5-1/4" 1.2mb int	79
Bemoulli Box II 5-1/4" 20mb int	1009
20mb ext. w/card	1309
dual 20 mb ext. w/card	1979
44mb internal w/card	1099
Plus Hard Card 20/40	489/549
Plus Hard Card II 80	595
Plus Hard Card 50XL/105XL	389/675
Western Digital IDE 40	239
Maxtor 40 meg IDE	240

MICE & MISC

Keycat II - 101 Keyboard w/Trackball	89
Microsoft Mouse w/windows 3.0	159
Microsoft Mouse w/PC Paintbrush	109
Mousesystems Mouse	89
Logitech Scan Man/Scan Man 256	179 295
Logitech Series 9 Serial/Bus	69 79
Logitech Track Man Serial/Bus	79 85
Summasketch 12x12/12x18	339 579
The Wave Keyboard	69
Marstek 105 w/Paintbrush and OCR	169
Marstek 800 w/Paintbrush and OCR	209
Marstek 800 for Windows	229
Epson ES 300 C Color Scanner	1450

SOFTWARE

Aldus PageMaker	
Carbon Copy	495
Clarion ProDeveloper	495
Clipper 5.0	385
Corel Draw	489
Dbase IV	415
Enable O/A	110
Finesse V3.1	195
Foxbase	325
Freelance Plus	455
Framework III	299
Harvard Graphics	229
IBM DisplayWrite V	299/345/399
Lotus 2.01 2.2 3.1	489
Lotus Symphony	149
Manager's Organizer	219
Microsoft Word	319
Microsoft Word for Windows	299
Microsoft Excel	249
Multimate 4.0	139
Reachtree III Complete	489
Paradox V3.5	645
Procom Plus	225
Q & A	315
Quatro Pro	485
Rbase V3.1	299
Super Calc V	529
Ventura Desktop Publ	249
Word Perfect 5.1	179/199
WordStar 5.5/6.0	279
WordStar 2000 +	249
WordStar Legacy	149
WordStar Laptop	219
Reachtree Double Bonus	109
Microsoft Windows 3.0	
Lots of other software available and all the prices are byte size!	

MULTI FUNCTION BOARDS

AST 286 6 Pack w/OK/w/1mb	105/169
AST 6 Pack Plus w/384K	145
AST 5251-11 Enhanced	499
AST Rampage 286	319
Everex Mini Magic w/o K	75
Intel Above Board w/512K	345
Intel Above Board PS w/512K	375
Intel Inboard 386 w/adapter	985
Intel Inboard 386 for PC w/1 mb	510
Intel Above Board II Plus	299
Intel Above Board +8 w/2mb	499
Intel Satisfaxion	419
Irma Board III	415
Logical Connection 256/512K	369/445
Orchid Ramquest 16/32 w/o K	129
Orchid Ramquest 8-16 w/1 meg	205
Orchid Tiny Turbo 286	289
Orchid Tiny Turbo Extra	249
Orchid Tiny Turbo AT	359
Expand	159

MATH CO-PROCESSORS

INTEL	
8087 3	79 387 25 505
8087 2	129 387 33 579
387 16	319 387 SX 319
387 20	405 287 XL/XLT 205
CYRIX	
387 16	275 387-33 476
387 20	309 387 SX16 245
387-25	390 387 SX20 259
ITT	
1mb Simm 80NS	59
256K Simm 80NS	19
Simm, Dram and Sipp	Call

287 8/10	139 165	387 16/20	259/299
287 12/20	179 199	387 25	379
387SX 16/20	239 259	387 33	465

MONITORS

<i>Get The Picture!</i>	
NEC	
MULTISYNC	
2A/3D	499/659
40/50	989 2350
PANASONIC	
1381/1391	389/499
SAMSUNG	
Flat White ML 4571	135
14" VGA Color CVJ 4891	335
MAGNAVOX	
Amber 776-RGB80 1130	99/255
LEADING EDGE	
31 VGA Color	309
CTX	
28 Super VGA Color (#5468)	
1024 x 768	359

All prices are cash prices! Retail outlet may have slightly higher prices

SALES HOT LINE

1.800.438.6039

Shipping Information and

International Customers: 1.404.860.7364

FAX: 1.404.860.7350

BULLDOG

COMPUTER PRODUCTS

800 Industrial Park Drive

Evans, Georgia 30609

HOURS: Monday thru Friday 8:30 a.m. to 7:30 p.m.

Saturday 9:00 a.m. to 4:00 p.m.

WE ACCEPT

MasterCard American Express VISA DISCOVER

Purchase Orders

w/Approved Credit!

LEADING EDGE

MMC

honesty

MEMORY!

FIRST SOURCE
INTERNATIONAL, INC.

"The Only Source for Computer Memory!"

WE ACCEPT INTERNATIONAL ORDERS

3 DAY INT'L DELIVERY VIA FED EX OR DHL!

CALL 714-588-9866 or FAX 714-588-9872

TOLL FREE FROM ANYWHERE IN THE U.S. OR CANADA

ORDER NOW 1-800-535-5892



LAPTOP MEMORY

TOSHIBA

Model 1000SE/XE/LE	1MB	\$219.00
Model 1000LE, 2000SX	2MB	\$299.00
Model 1000LE, 2000SX	4MB	\$749.00
Model T12000C	2MB	\$1399.00
Model T1600	2MB	\$169.00
Model T1700E	2MB	\$169.00
Model T181000X	2MB	\$169.00
Model T20000	2MB	\$169.00
Model T20000	4MB	\$469.00
Model T2000	2MB	\$299.00
Model T5100	2MB	\$169.00
Model T5200 T8500	2MB	\$169.00
Model T5200 T8500	4MB	\$999.00

COMPAQ

Portable LTE 286	1MB	\$135.00
Portable LTE 286	2MB	\$185.00
SLT-286	4MB	\$299.00
SLT-286	8MB	\$165.00
SLT-286	4MB	\$299.00
SLT-286	2MB	\$225.00
SLT-286	2MB	\$329.00

ZENITH

SuperSport 286, 286e	1MB	\$179.00
SuperSport SX, 286e	2MB	\$239.00
SuperSport SX	2MB	\$259.00

NEC

ProSpeed 286, 386SX/16	1MB	\$249.00
ProSpeed 386SX/20	2MB	\$249.00
ProSpeed 386	2MB	\$349.00
ProSpeed 386	4MB	\$1499.00

IBM MEMORY

Model PS/1	1057035	\$85.00
Models 30-286, Exp. Board 1497259	8MB PN N/A	\$249.00
Models 70-E61/121, 655X, 655X	4MB	\$45.00
Models 70-E61/121, 602, 655X, 655X	2MB KIT	\$139.00
Models 555X, 655X, 34F3077 & 34F3011	1MB	\$79.00
Models 555X, 655X, 34F3077 & 34F3011	2MB	\$139.00
Model 70-A21	4MB	\$339.00
Models 80-A21/A31	4MB	\$149.00
Models 90, 95 and P75	1MB	\$330.00
All Models 70 and 80	2-14MB w/2M, 34F3011	\$235.00
All Models 50 and 60	2-14MB w/2M, 34F3011	\$470.00
All Models 50 and 60	2-14MB w/2M, 34F3011	\$499.00

LASER PRINTER MEMORY

Hewlett-Packard LaserJet IIP, III & IID	2MB	\$149.00
Hewlett-Packard LaserJet II & IID	4MB	\$279.00
Hewlett-Packard LaserJet II & IID	4MB	\$159.00
Panasonic 4450I and 4420	4MB	\$279.00
IBM Laser 4019 and 4019e	1MB	\$139.00
IBM Laser 4019 and 4019e	1MB	\$199.00
Canon LBP-8II, 8IR, 8IIT	1MB	\$195.00
Canon LBP-8II, 8IR, 8IIT	4MB	\$289.00
Canon LBP-8II, 8IR, 8IIT	1MB	\$169.00
OKI Laser 400, 500, 600, 800	1MB	\$219.00
OKI Laser 400, 500, 600, 800	1MB	\$219.00

BRAND NEW!

For Compaq LTE386S/20

1MB \$1325.00

For Canon LBP-4

1MB \$225.00

2MB \$399.00

For Canon LBP-8III

2MB \$399.00

4MB \$549.00

AST MEMORY

Premium 386C and 386-16

1MB \$85.00

2MB \$289.00

Premium 386-20

1MB \$99.00

2MB \$319.00

Premium 386-3X/16/25/33 and Cupid card

1MB \$79.00

Premium 486

2MB \$199.00

Premium II 386SX/20 and 386SX/16

1MB \$99.00

4MB \$459.00

HEWLETT-PACKARD MEMORY

Vectra GS/20PC, RS/25PC and 20C

1MB \$79.00

4MB \$275.00

Vectra 486 PC and 386/25 PC

4MB \$419.00

Vectra 386/25 PC

4MB \$154.00

Kingston

COMPAQ MEMORY

DeskPro 286 E, 386 20, 20E, 25	4MB	\$109.00
DeskPro 286 E, 386 20, 20E, 25	4MB	\$289.00
DeskPro 386S/16	4MB	\$109.00
DeskPro 386S/16	4MB	\$289.00
DeskPro 286N, 386N and 386SX/20	4MB	\$79.00
DeskPro 286N, 386N and 386SX/20	4MB	\$149.00
DeskPro 386-33, 486-33 & SystemPro	4MB	\$149.00
DeskPro 386-33, 486-33 & SystemPro	4MB	\$999.00

SIMM MODULES

IBM COMPATIBLE

1MB	\$259.00
2MB	\$329.00
4MB	\$529.00
8MB	\$829.00
16MB	\$159.00
32MB	\$219.00

TERMS AND CONDITIONS

VISA	SEND P.O.'S AND MAIL ORDERS TO
MasterCard	First Source International, Inc.
Amex	Attn: Sales Dept.
Discover	100% compatible or full refund
Apple Pay	100% compatible or full refund
Novell	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	100% compatible or full refund
NEC	100% compatible or full refund
Zenith	100% compatible or full refund
IBM	100% compatible or full refund
Compaq	100% compatible or full refund
AST	100% compatible or full refund
HP	

800-558-0003

Since 1989
ComputAbility
Consumer Electronics

800-558-0003

BOARDS

Video 7 Vega VGA	\$129	ATI VGA Wonder + 512K	\$229
Video 7 VRAM - 512K	\$339	ATI VGA Basic	\$89
Video 7 1024i - 256K	\$169	Paradise Basic VGA	\$109
Video 7 1024i - 512K	\$209	Paradise VGA +	\$129
ATI VGA Wonder + 256K	\$199	Paradise 1024i - 512K	\$229

CHINON CD ROM PACKAGES

External and Internal Available
Includes Software Toolworks
CD-ROM Software

CALL FOR CURRENT PRICES!

PRINTERS

Panasonic
Office Automation

KX-P 1180	\$149	KX-P 1624	\$369
KX-P 1124	\$249	KX-P 4420	\$849

CALL FOR THESE NEW
KX-P MODEL B1
• 1123 • 1124 • 1654 • 4450

CITIZEN

200GX	\$169
GSX 140	\$289
GSX 145 Wide car-24ph.	\$399
Color KX-200/GSX 140	\$49

SEIKO
Smart Label - Low Price \$165 |

star
RECEIVERS

NX-1001 Multifont	\$139
NX-1020 Rainbow	\$185
NX 2420	\$279
NX 2420 Rainbow	\$299

Special Price
Altima NSX
386SX NOTEBOOK
\$2599*

*FREE DELIVERY in the contiguous 48 states

MONITORS

MAGNAVOX 7CM320 \$329

28DP 800 x 600 VGA - While supplies last

Gold Star 1420 - 14" EGA	\$275
Gold Star 1425+ - VGA 640x800	\$275
Gold Star 1450+ - 31DP 800x600	\$315
Gold Star 1460 - 14" SVGA 28DP	\$345
Magnavox 78M749 VGA Monochrome	\$129
Magnavox CM9032 41DP VGA 640 x 480	\$259
Panasonic 1381 28DP 1024x768	\$309
Packard Bell 8510SV 28DP 1024 x 768	\$339
Packard Bell 8529 31DP 640 x 480	\$299
Packard Bell 8539 39DP VGA 640 x 480	\$269
Packard Bell 8551 51DP VGA 640 x 480	\$229
Emerson 1415 EM VGA 41DP 640x480	\$239
Scott SM2320 - 14" multiscan 31DP	\$299
Sony 1304 26DP 1024x768 non-interlaced	\$649

MODEMS • MODEMS

Cardinal 2400 External	\$95
Cardinal 2400 External w/MNP5	\$145
Cardinal 2400 Internal	\$71
Cardinal 2400 Internal w/MNP5	\$119
Cardinal 9650 V.32 Internal	\$469
Supra 2400 External	\$95
Supra 2400 External w/ MNP5	\$145
Supra 2400 + Ext w/MNP5 V.42 B1B	\$165
Supra 2400 Internal	\$65
Supra 2400 Internal w/MNP5	\$105
Supra 2400 Int. w/MNP5 V.42 B1B	\$135
Zoom 2400 External	\$89
Zoom 2400 External and Band Fax	\$99
Zoom 2400 Internal	\$75
Zoom 2400 Internal and Band Fax	\$89
Zoom 2400 V.42 B1B External	\$169

Colorado Memory

DJ10-120MB	239
AB10 Internal Adaptor	69
KE10 External Adaptor	119
DJ20 - 250MB	305
FC10 Internal Adaptor	84
External Adaptor-DJ20	CALL

• NEC MultiSync •

• Graphics Engine •

16 Colors	\$575*
256 Colors	\$879*

*FREE DELIVERY in the contiguous 48 states

MICE/TRACKBALLS & HAND SCANNERS

The Typist PC/AT \$379

MICROSOFT	
MS Serial/Bus Mouse + Paint	\$99
MS Serial/Bus Mouse + Win 3.0	\$145
MS Serial Mouse w/MS Works	\$149
LOGITECH	
Denon Serial with Pad	\$29
Scanman + PC	\$165
Scanman Model 256 (gray scale)	\$282
Scanman with Catch Word	\$275
Mouseman-Serial/Bus 400DPI	\$69/76
Mouseman Serial w/ Window 400 DPI	\$133
Trackman Serial/Bus	\$77/84
MICRO SPEED PC Trm Ser/Bus	\$75/85
Complete PC Communicator	\$395
Complete PC Full Page Scanner	\$509

MARSTEK SCANNERS

Mars 800+ w/OCR	\$185
Mars 800+ for Windows	\$265
Mars 105+ with Paint	\$149
Mars 105+ for Windows	\$235

TOSHIBA

FLOPPY DRIVES

5.25" 360KB PC/XT	\$63
5.25" 1.22MB PC/AT	\$73
3.5" 720KB PC/XT	\$59
3.5" 1.44MB PC/AT	\$73

LANtastic Starter Kits

LANtastic Ethernet	\$489
LANtastic 2Mbps	\$359

1 Dr Plus 3.0	46.95	Mass Utilities 1990	88.95	PC USA 2.0	38.95
Adobe Disk 4.0	57.95	Mass Vaccine	59.95	PD Owner	58.95
ACT! 2.0	212.95	Managing Your Money 7.0	129.95	Proactive III Complete	143.95
Address Book Plus	44.95	Math CAD V2.5	208.95	Proactive III w/PRO III	211.95
Adobe Type Manager 2.0	56.95	Math Rabbit	24.95	Percent Edge 1.0	63.95
Adv. Revolution 2.0	829.95	Microcam 911	87.95	Perform 2.1-84 \$30 Rebate	164.95
And Professional 1.2	287.95	Micrographix Charisma 2.0	318.95	Perform Filter	78.95
Ask Sam 5.0	208.95	Micrographix Designer 3.02	448.95	Perform Filter Pro	124.95
Auto Sketch 3.0	142.95	Micrographix Draw + 1.1	148.95	Perform Pro	264.95
Autodesk Animator 1.0	274.95	Micrographix Xport	132.95	Personal Law Firm	54.95
Animator Clips on	89.95	Mirror III V2.0	83.95	Personal Lawyer	33.95
Autosave	35.95	Money Matters 2.0	36.95	Picture Publisher Plus 2.5	379.95
Avalgo Publisher	182.95	More Fonts V2.0	73.95	PFS 1st Choice w/Prodigy 3.1	102.95
Back It 4.0	70.95	Move 'em English	51.95	PFS 1st Publisher 3.0	91.95
Back Up 6.0-Central PL	57.95	MS DOS V3.3	54.95	PFS OfficeWriter V8.1	239.95
Battery Watch	28.95	MS DOS 4.01	58.95	PFS Pro File V2.01	179.95
Beeper Tools 2.0	75.95	MS Basic Dev Sys. 7.1	314.95	PFS Pro Plus V1.02	63.95
Borland C++	315.95	MS C Compiler 6.0	314.95	PFS Pro Write 2.2	151.95
Calendar Creator 4.0	39.95	MS Cobol Comp. 3.0	574.95	Pizzaz Plus 2.0	65.95
Carbon Copy Plus 5.22	111.95	MS Excel 3.0	299.95	Pop Drop Plus 1.0	53.95
Carver Design	81.95	MS Flight Simulator 4.0	38.95	Power Basic	71.95
Check It 3.0	79.95	MS Learning PC DOS	32.95	Power Menu	52.95
Carver Design	81.95	MS Macro Assembler	97.95	Presentation Team 2.0 (Gem)	319.95
Clarion Person. Dev. V2.0	44.95	MS Multiplex 4.2	124.95	Print Cache 2.3	99.95
Clarion Pro Dev. V2.1	449.95	MS Office for Windows	624.95	PrintShop (New)	38.95
Clipper 5.0	496.95	MS Office for Windows	624.95	PrintShop (New) Companion	30.95
Colorix (VGA Paint)	94.95	MS Pascal Comp 4.0	183.95	Procam Plus 2.0	65.95
Compu DOS 386 10U	275.95	MS Power Point 1.0	314.95	Prodigy Starter Kit	78.95
Copier II PC 6.0	25.95	MS Project 4.0	314.95	Publish III V1.2 w/Design Ideas	133.95
Corel Draw 2.0 for Windows	365.95	MS Project for Windows 1.0	434.95	Publishers Pak/Draw 2.0	267.95
CSAGE IV 1.1	475.95	MS Quick Basic 4.5	81.95	Q & A Networking	254.95
Dec Bonus Pack 4.1	124.95	MS Quick C 2.5	81.95	Q & A V3	216.95
Dec Easy Accounting 4.1	80.95	MS Quick C/Dutch As 2.5	124.95	Q DOS II	35.95
Dec Easy Payroll 4.1	54.95			Q DOS 386 5.0	81.95
Dec Easy Rapid Tax	47.95			Q DOS 50/60	81.95
DB Fast for Windows 1.5	233.95			Q RAM	49.95
Definitions Plus	60.95			Quattro Pro 2.0	309.95
Design CAD 2D 4.2	142.95			Quattro 4.0	37.95
Design CAD 3D 3.1	168.95			R: BASE for DOS 3.0	467.95
Desk Link	98.95			R: BASE - Personal V1.0	74.95
Desktop 2 V2.3	79.95			ReadRight	294.95
Desktop 386 2.3/5.1	129.95			Ready Aim - File	89.95
Direct Access 5.0	80.95			Rescue II Host & Call	104.95
Double DOS	41.95			Rescue Kit	25.95
Dr DOS 5.0	131.95			Right Writer 4.0	54.95
Drift CAD for Win	409.95			Sideways 3.3	58.95
Draw Perfect 1.1	289.95			Smartware II	429.95
Enable GA	409.95			Soft Type	108.95
Express Publisher V2.0	85.95			Splawrite II	82.95
Family Tree Maker	41.95			Statgraphics 4.0 A	539.95
Fast Back + 2.1	111.95			Superbase 2 V 1.2	209.95
Fast Pak Mail	44.95			Superbase 4 for Windows 1.2	409.95
Finance V3.1	97.95			Superbase 4 (5 user Net Ext.)	599.95
Flow Charting 3	135.95			SuperCalc 5	91.95
For the Record 1.0	31.95			Switch II	55.95
Form Filter 3.0	79.95			Tax Calc	51.95
Form Publisher Win 1.21	138.95			Text Port for Windows	314.95
Form Total Gold 3.0	54.95			Thin	294.95
Formwork w/FB & FB 2.5	80.95			Timeline 4.0	441.95
Formbase	CALL			TimeSteps III V4.0	188.95
Form Pro 1.02	CALL			Toolbook	281.95
Gene Artline 2.0	382.95			Top Priority	55.95
Genetic Card 3D Desk	199.95			Turbo Basic 1.1	68.95
Genetic Card 5.0	221.95			Turbo Debug-Tool 2.0	102.95
Genetics Ensemble	121.95			Turbo EMS	50.95
Glyphix for WP	65.95			Turbo Pascal 6.0	93.95
Grammarix 4	47.95			Turbo Pascal Pro 6.0	194.95
Grammarix 4 for Windows	54.95			Turbo Tax Personal 1040	43.95
Grandview 2.0	188.95			Turbo Tax w/Quicken 8.0	67.95
Group 4.0	185.95			Typing Tutor IV	29.95
Harvard Graphics	CALL			Ultra Vision w/Quicken 2.0	72.95
MD File Apps	63.95			VirexKit	81.95
MD First Apps 1.0	51.95			Virex PC 1.1	73.95
MD Icon Designer	31.95			Wealth Builder 1.1	134.95
MD Win Express V3.0	49.95			Wealth Starter 1.0	34.95
Headroom	87.95			Who What When V2.0	167.95
Holivia	66.95			Win Maker 4.0	38.95
Impress	71.95			WinFax	43.95
Info Select 1.1	55.95			WinFax for Win	309.95
Info Spotter 5.0	48.95			Win Sketch for Windows	74.95
Kryofix Advanced	111.95			Word Perfect 5.1	239.95
Labels Unlimited A	45.95			Word Perfect for Win	285.95
Laplink Release III 3.0	85.95			Word Perfect Upgrade for Win	104.95
Laser Control 3.4	88.95			Word Perfect Connections	364.95
Letter Perfect 1.0	122.95			Word Perfect Executive	313.95
Lotus ALL VERSIONS	CALL			Word Perfect Rhymer	88.95
Mac Format	43.95			Word Writer PC	36.95
Mac Performance	43.95			W Perfect Office PC 3.0	79.95
Mac Prevention	43.95			Xtree Gold 2.0	98.95
Mac Recovery	43.95			XY Write 3+	204.95
Mac Utilities 5.0	81.95			Your Way	114.95



SHIPPING CHARGES
Order 1 or 1,000 software titles and shipping in the contiguous 48 states is only
\$4 PER ORDER!

MS Quick Pascal	81.95
MS Windows 3.0	94.95
MS Windows Productivity Pak	41.95
MS Windows Dev Tool 3.0	314.95
MS Word 5.5	209.95
MS Word for Win 1.1	309.95
MS Word Network Mode	120.95
MS Works 2.0	92.95
Name That Disk	24.95
Netroom 640/Single User	50.95
Netroom-Utility and User	279.95
Norton AntiVirus 1.0	63.95
Norton Backup 1.1	94.95
Norton Commander 3.0	94.95
Norton Editor	47.95
Norton Utilities 5.0	113.95
Notepad	209.95
One Write Acad. Sys. 2.06	173.95
Optima	44.95
Org Plus Advanced	60.95
Pacibel 2000	27.95
Pack Rat (word win) V3.0	235.95
Paradox 3.5	494.95
PC Anywhere 3	81.95
PC Anywhere 4	101.95
PC File 5.0	83.95
PC Globe 4.0	36.95
NaGone Disk	13.95
PC Pak/Draw IV+	105.95
PC Tools Defrag 6.0	86.95



Make PC MAGAZINE Come Alive!

Join PC MagNet and have instant access to PC MAGAZINE's programs and product reviews.

PC MagNet is *PC MAGAZINE's* on-line information service, which is administered by CompuServe. A PC MagNet account gives you:

- Access to all of *PC MAGAZINE's* utilities and programs
- The latest PC Labs Benchmark tests
- New versions of *PC MAGAZINE's* utilities
- A way to talk directly with *PC MAGAZINE* editors and columnists
- On-line support for our programs in the forums
- Direct entry to the Computer Library family of databases
- A downloadable-index to *PC MAGAZINE's* product reviews

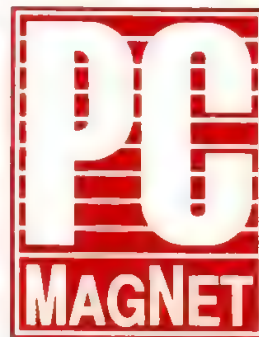
One call gets you started!

Sign up on-line at no additional charge.

1. To subscribe, set your communications software for either 300, 1,200 or 2,400 bps, 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest your dialing exchange, dial (800) FIND CIS (346-3247). When the modem connects, press <Enter>. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you. After you have found the phone number, hang up and dial using the number you just found.
2. When you receive a CONNECT or CARRIER DETECTED message, enter **Ctrl-C**.
3. At the HOST NAME prompt, enter **CIS**.
4. At the USER ID prompt, enter **177000,5000**.
5. At the PASSWORD prompt, enter **PC*MAGNET**.
6. At the Enter agreement number prompt, enter **Z10D9000**.
7. Register your name and enter your **VISA, MasterCard, or American Express** account number. You may choose to have your company billed directly by choosing Business Account Invoicing. For more information about Business Account Invoicing, call (800) 848-8199.
8. Your personal **User ID** number and **Password** will be displayed at the end of the subscription process. Please record them in a secure place.
9. A new password will arrive in the mail within 10 days to confirm your subscription.

There are no connect charges for PC MagNet during the subscription process. PC MagNet costs \$12.80 an hour for 1,200/2,400-bps service and \$6.30 for 300-bps, via MasterCard, VISA, or American Express. For assistance regarding passwords, membership, billing or payment terms, call Customer Assistance at (800) 848-8990; outside the United States, call (614) 457-8650. There are no upfront subscription fees, or monthly charges. You pay only for the time spent on-line.

CompuServe members can join by entering GO PCMAG at any CompuServe prompt.



CIRCLE 497 ON READER SERVICE CARD

P

PREMIER

The four-color showcase that spotlights leading-edge PC products and services.

450-455

C

CLASSIFIED

Flexible-format display advertising: computer systems, components, software and more.

456-468

B

BUSINESSCARD

A forum for innovative, hard-to-find and low cost PC hardware, software and services.

469-471

PRODUCT CATEGORIES

	P	C	B		P	C	B		P	C	B		P	C	B
HARDWARE				SOFTWARE								MISCELLANEOUS			
Add-On-Boards	450	456		Accounting		461		Health				Accessories	455	465	
Backup Power				Backup Systems				Inventory			470	Bar Coding	455	465	
Cables				Business	452	461	469	Legal				Books/ Catalogues/ Publications		467	
CD-ROM		456	469	Business Project Management				Mailing Programs	454	463	470	Business Opportunities			
Communications	450			Business Time Management			469	Manufacturing				Consultants			
Computer Systems	450	456		CAD/CAM	452			Medical			470	Data Conversion		467	
Connectivity				Communications	453	462		Multisusers				Data Recovery Services		467	
Disk Drives	451			Computer Languages				Music		463		Disk Conversion		468	
Diskettes		458		Construction			469	One-Of-A-Kind				Diskette Copy Services	468	471	
Expansion Units		459	469	Data Base		462	469	Preventive Maintenance		464	470	Insurance		468	
Input Devices				Data Entry	453	462		Programmers Tools	455	464	470	Mailing Lists			
Monitors				Data Management				Public Domain/Shareware		464		Networking			
Peripherals	451			Data Transfer				Real Estate		464	470	Services			
Plotters				Desktop Publishing	453	462		Religion		464	470	Supplies		468	
Power Supplies	452			Diagnostic		462		Sales Marketing				Trade Shows			
Printers		459		Dictionary				Scientific			470	Training/Tutorials			
Rentals			469	Education		462	469	Security		464					
Security				Engineering		462		Statistics	455	465	471				
Speed Devices				Entertainment/Games	454	462		Surveys		465					
Tape Drive Subsystems	452	459		Financial		463		Taxes							
				Flow Chart			469	Terminal Emulation							
				Foreign Languages		463		Utilities		465	471				
				General				Windows		465	471				
				Graphics	454	463	469	Word Processing		465					



BLAST YOUR MESSAGE THRU!

**Voice Messaging • Call Processing
AudioTex • Telemarketing
Order Processing • Call Distribution**

Powerline transforms your computer (PC/XT/AT/386) into a multi-line voice processing command center. Intelligently process your sales inquiries and messages in the background. Give your computer some punch! Hardware, software, cables, speaker, 2 year warranty.

Single Line (Bigmouth) \$295

Multi-line \$895

(Developer/OEM packages available)
VISA - MC - AMEX - COD

For Information
Or Sales Call:

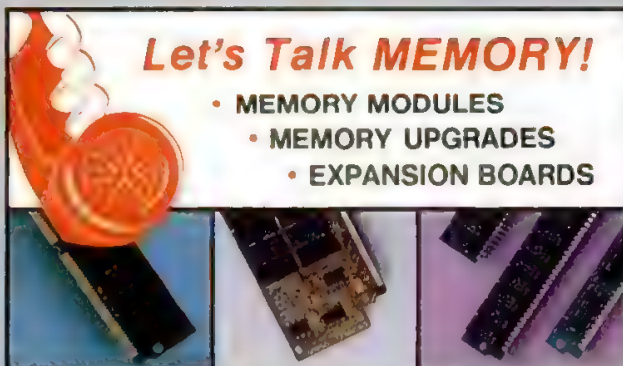
(415) 522-3800

FAX (415) 522-5556

TALKING TECHNOLOGY, INC.
1125 ATLANTIC AVE. • ALAMEDA, CA 94501



CIRCLE 901 ON READER SERVICE CARD



Let's Talk MEMORY!

- MEMORY MODULES
- MEMORY UPGRADES
- EXPANSION BOARDS

Enhance is an extensive line of high quality memory enhancement products. It is 100% compatible with the world's leading manufacturers of PC's, Laptops, Portables, Workstations, Servers and Laser Printers. The Enhance product line comes with a guarantee of immediate delivery, technical support, and quality products with a 5 year warranty.

Call us for Math Coprocessors

Call or Write for your **FREE MEMORY KIT**

TOLL FREE U.S. 1-800-343-0100
and Canada

TOLL FREE CA 1-800-662-1004

Distributed by **Sys-Com**
18720 Oxnard Street, #102
Tarzana, CA 91356

(818)343-3066

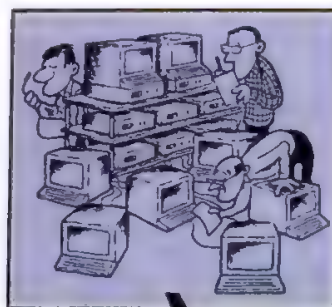
Fax: 818/343-1436

CIRCLE 902 ON READER SERVICE CARD

ENHANCE

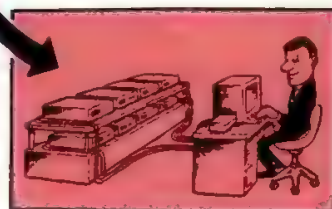
CONTROL UP TO 96 PC FILE SERVERS WITH 1 KEYBOARD AND MONITOR USING...

COMMANDER by cybex



- No external power
- "One-Touch" selection
- Mix PC, PC/XT, PC/AT and PS/2
- "AutoBoot" Feature boots attached computers without operator intervention after power failure
- Shows PC power status
- Mouse support available
- TTL (MDA, CGA, EGA) up to 600 feet away

- VGA up to 400 feet
- Each unit accommodates from 2 to 8 PCs
- Up to 12 units can be cascaded
- Mounting kit available for 19" rack installation



Dealer Program Available

Cybex Corporation

2800-H Bob Wallace Ave. • Huntsville, AL 35805
(205) 534-0011 • FAX (205) 534-0010

CIRCLE 903 ON READER SERVICE CARD



Affordable PC Power!

Standard Features

- 30-Day Guarantee
- Unlimited Toll-Free Technical Support
- 1 Year GE On-Site Service
- Custom Configurations
- We Accept Visa, M/C, AEX, and Discover Cards



BLACKSHIP
COMPUTER SYSTEMS, INC.

Call Blackship for all your System and Networking needs.

We have a complete line-up of 286, 386, 386SX, 486, and Laptops.

4031 Clipper Court • Fremont, CA 94538

Tel: 415-770-9300, Fax: 415-770-8674

Toll-Free Orders

1-800-877-6249

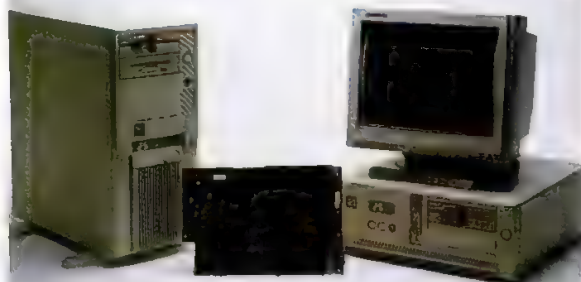
CIRCLE 904 ON READER SERVICE CARD

The Color Showcase
for Leading-Edge PC
Products and Services



ariel design inc

computer solutions
45 Pond St., Norwell, MA



MOTHERBOARDS and SYSTEMS AMI 386/486 CACHE

AMI 386sx-16'
AMI 386sx-20 32k Cache
AMI MKIII 386-25 64k Cache
AMI MKIII 386-33 64k Cache
AMI Voyager 486-25 128k Cache ISA Bus
AMI Enterprise 486-3364k Cache EISA Bus

Motherboards from the industry leader. We can sell you a motherboard or a complete system. Call for the best price.

1-800-55ariel

available in limited quantities

CIRCLE 906 ON READER SERVICE CARD



**Experience
the Power!**
Toshiba's Most
Economical
AC Power
Portable.

T3100e

Now only
\$2449

- Exceptionally Compact - weighs only 13.2 pounds
- 12 MHz 20286 microprocessor
- 20MB or 40MB hard drive
- 1MB RAM
- Expandable to 5MB
- 1.44MB 3.5" disk drive
- PS/2 Compatible
- MS-DOS & Disk Cache
- High-Res CGA display

TOSHIBA

Prices subject to change without notice



Plain Wrap Prices,
Black Tie Service.

Call Toll Free to Order
1-800-274-6611
Or FAX IT!
1-818-884-5310
Monday thru Friday
7:00AM to 5:00PM PST

CIRCLE 905 ON READER SERVICE CARD

DISC DRIVES • DISC DRIVES • DISC DRIVES

jb TECHNOLOGIES, INC.

Dealers, Self-Maintainers, TPM Companies: **LOOK!**

DISC DRIVE SUPPORT

SALES

EXCHANGE PROGRAM TOO!

DATA RECOVERY

FROM PC/MS-DOS ENVIRONMENT

REPAIR

COST EFFECTIVE...
MOST 5 1/4" & 3 1/2" DRIVES

✓ **Save 10%**

LOWEST PRICES...
COMPARE!

20 MB **\$129**

Miniscribe
NEVER USED
Complete HD Kit
(SCSI) **\$150**
Incl. Ctrlr & Cable

HUNDREDS OF OTHER
MODELS IN STOCK

(805) 529-0908

FAX: (805) 529-0908

5105 Maureen Lane

CIRCLE 910 ON

READER SERVICE CARD

CIRCLE 907 ON READER SERVICE CARD

FAST PS/2 & AT DISKS

Failsafe Novell Subsystems

The power user's first choice. Peridot's subsystems offer failsafe peak performance without stretching your budget. We support DOS, OS 2, Xenix, Unix, Netware 286 & 386 for both AT & PS 2s. No compatibility issues. No problems. It's that simple.

**5
Year
Warranty**

We Back Our 5.25" Drives for 5 Years!

Drive in the
Fast Lane!

20 MHz Transfer Rate
15 Ms Access Time
16 MB Cache

Plug & Play
Solution from
Peridot

1 GB Erasable Optical
& 900 MB Tape Drives

System	Capacity	Access	Interface	Price
AT	120 MB	18 ms	IDE	\$549
AT	215 MB	15 ms	IDE	\$671
AT	215 MB	18 ms	SCSI	\$961
AT	330 MB	18 ms	IDE/SCSI	\$1443
AT	670 MB	18 ms	IDE/SCSI	\$2065
AT	710 MB	15 ms	SCSI	\$3646
AT	1.2 GB	15 ms	SCSI	\$3261
PS 2	110 MB	18 ms	SCSI	\$933
PS 2	230 MB	18 ms	SCSI	\$1736
PS 2	330 MB	15 ms	SCSI	\$2174
PS 2-20	65 MB	19 ms	SCSI	\$637

- ✓ Caching Controllers
 - ✓ Disk Mirroring & Duplexing
 - ✓ Torture-Tested Drives
with 24-hour Burn-in
 - ✓ Lifetime Toll-Free Support
- Drive, Controller, Cables, Software
Included with Subsystems.



Call for Peridot's Complete Product Catalog

800-447-8226

International Tel: +08-988-2232

Fax: +08-988-1431

CIRCLE 908 ON READER SERVICE CARD

Total PC Automation at Your Convenience!

The Pendulum
PowerPak:

- Instructs your PC to power ON/OFF at pre-selected times—locally or remotely
- Runs applications using Auto-Might™, the Event Scheduler—totally unattended!!
- Reboots your PC automatically



Call **1-800-772-6483**

The Pendulum Group, Inc.

333 W Hampden Ave. #1015 • Englewood, CO 80110 • (303) 755-1444 • FAX (303) 755-1445

CIRCLE 909 ON READER SERVICE CARD

The Color Showcase
for Leading-Edge PC
Products and Services

POWER UP! with the INSIGHT UPS!

Protect Your Equipment Prevent Power Failures!

New In-Line™ Technology gives you:
True Sine-Wave Power for less!
Super Light weight! Just 28lbs!
Low, Low price!
Almost twice the power
of comparably priced units!
Runs a loaded
386/25MHz system
and VGA Monitor
up to 30 minutes!

Just

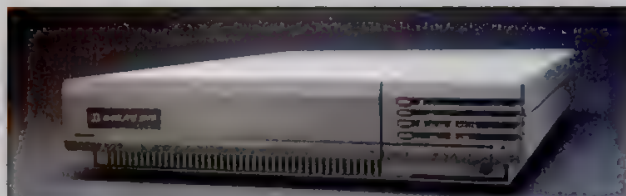
\$ **549**

Get Insight Protection. Call **800-729-0770**

Insight
1912 West Fourth St
Dept. LA
Tempe, AZ 85281
Sales (602) 450-1124
Fax (602) 829-9193



CIRCLE 910 ON READER SERVICE CARD



Here are 3 reasons to buy the new OD3210 9-track tape drive.

1. It's the first 9-track drive designed for the modern office.
2. It's got great measurements: 3 1/2" x 16 1/2" x 23".
3. You can take it with you. It weighs only 30 pounds.
4. It's so quiet, you'll forget it's on.
5. It's completely autoloading. No manual threading required.
6. It uses only 45 watts (other drives average 200).
7. It's reliable. Very. No other drive has fewer moving parts.
8. It's surprisingly affordable.
9. It comes with a 2 year warranty, toll-free support, and the ODI Special Service Program.
10. It's designed and built by Overland Data.

True, we promised you 3 reasons. But we felt compelled to make up for the lack of reasons to buy any other drive. To find out more, call our toll-free number.

1-800-PC9-TRAK
1-800-729-8725
(fax) 619-571-0982

OVERLAND DATA
2000 Depue, CA

CIRCLE 911 ON READER SERVICE CARD

9 TRACK TAPE DRIVES 3480 TAPE DRIVES FOR PC/XT/AT/386/386/PS2

LOWEST
PRICES
BEST
QUALITY



LAGUNA CONVERSION SYSTEMS

26941 Cabot Road
Suite 131
Laguna Hills, CA 92653-7007

(800) 266-4 LAG
(714) 467-0497 FAX
(714) 467-0508 FAX

CIRCLE 912 ON READER SERVICE CARD

LEARN ABOUT POINT OF SALE!!!

thru Video

GIVE YOUR BUSINESS THE COMPETITIVE
ADVANTAGE IT NEEDS TO SUCCEED!!!

"A COMPUTERIZED POINT OF SALE SYSTEM"

\$29.95

Our video tape fully illustrates Point
of Sale products, Hardware and
Software, how it operates and what
capabilities should be there for your
sales environment.



Cash Drawers
Receipt Printers
Programmable Keyboards
Barcode Scanning Devices
POS Terminals
Portable Terminals
Barcode Printers

AT ONLY \$29.95 THIS VIDEO
WILL SAVE YOU THOUSANDS

- Why spend \$\$\$\$\$\$\$\$\$\$ before you learn about Point of Sale and how it works.
- Some equipment saves time and money, some equipment doesn't.
- Spark your interest in time saving Sales Techniques and Management.
- Enjoy better control of your business, and better knowledge of your profits.
- What are standard features for "Point of Sale"????
- Knowing what computers and point of sale can do is essential to any business in the 90's.

Computer Time of America 1-800-456-1159 mon-sat

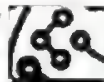
P.O. Box 10
Johnstown, PA 15904



CIRCLE 913 ON READER SERVICE CARD

ENVISION IT

Before Envision It
Conversion:
TIF (taster file)



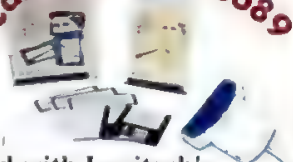
After Envision It
Conversion:
DVI (vector file)



Raster-to-Vector Conversion Software

Lets you scan into CAD and
most other drawing programs!

Call (800) 321-3689



Special Offer

\$299 Envision It (retail \$399)

\$399 Envision It bundled with Logitech's
ScanMan Plus hand held scanner (retail \$738)

1991 E.S.I. Inc. • 822 Muller Road • Burlingame, CA 94010 • All rights reserved

CIRCLE 914 ON READER SERVICE CARD

RJE+3270+Gateway Print 20,000 lines/minute

Features:

connect up to six S/370
channel-attached
printers
IBM 3203, 3211, 4245
Xerox 4050, 4090,
8790, 9790 and more
print spooling
electronic forms
management
line speeds to
384,000 bps with
DATMODE=FULL
dial-up or dedicated
lines

New Product:

BARR/GATE:

RJE+3270 Gateway
Up to 250 users
SDLC, Token Ring,
Novell IPX, or
NETBIOS connections
Send/Receive
commands
EHLLAPI
3287 printers

One call is all you need for the complete solution for your RJE, remote print, and 3270 applications. See for yourself why more than 11,000 users put their trust in BARR products. Call today for a 30-day evaluation.

MORE SPEED MORE FEATURES MORE SOLUTIONS

BARR

Barr Systems, Inc.
4131 NW 28 Lane
Gainesville, FL 32606-6681
800-BARR-SYS or 800-227-7797

CIRCLE 915 ON READER SERVICE CARD

FREE FONTS! FOR WORDPERFECT OR WINDOWS



This is the best font deal you'll find anywhere! At \$79.95, Publisher's Powerpak is the least expensive font program on the market. And, if you purchase Powerpak before May 30, we'll send you these 6 great looking scalable typefaces -- a \$90 value -- *absolutely free!*

Eureka Baxter
Silicon Merced
Springer



* Send in this offer with your Registration Warranty Card, sales receipt and \$6.00 shipping. Not valid with any other offer. Indicate desired format: ☐ 3 1/2 ☐ 5 1/4



For more information, call
ATECH SOFTWARE
(800) 748-5657

5964 La Place Ct., #125, Carlsbad, CA 92008

CIRCLE 918 ON READER SERVICE CARD

PCM

AT&T, Microsoft, 3M, and Lotus use

The Major BBS.®

To find out why they use
our software, call us at

(305) 583-5990

Our 2-line starter system,
for COM1/2/3/4, is only

\$59

Includes electronic mail,
teleconferencing, file transfer,
public message bases, polls,
powerful Sysop control
& more!

GALACTICOMM

CIRCLE 916 ON READER SERVICE CARD

How to Make Great Gray-Scale Images!

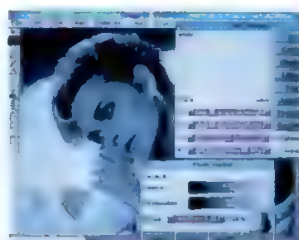


Image-In Scan/Paint and Plus provide easy, sophisticated scanning and gray-scale editing—an electronic darkroom running under Windows 3.0 with filters to soften, sharpen, blend and more. Change contrast, adjust 256 gray levels, posterize. Complete control of gray-scale and line art images! Call for your free booklet **HOW TO MAKE GREAT GRAY-SCALE IMAGES!**

Supports these scanners:

Canon
The Complete PC
Compugraphic
HP ScanJet

Epson
IBM 3119
Logitech
NISCA

Marstek
Microtek
Ricoh



IMAGE-IN
INCORPORATED

1-800-345-3540

406 E. 79th St. • Minneapolis, MN 55420 • FAX 612-888-3665

Outside N. America call CPI, Geneva ++41-22-436-800

CIRCLE 919 ON READER SERVICE CARD

Replaces
Key-to-Disk
Systems

ENTRYPOINT

DATA ENTRY FEATURES

- ▶ Headsdown speed
- ▶ Paint-the-screen form design
- ▶ Menu-driven edit selection
- ▶ Field and char type validation
- ▶ Range checks
- ▶ Table lookup
- ▶ Check digits
- ▶ Accumulator balancing
- ▶ Programmable function keys
- ▶ Operator statistics
- ▶ LAN or single station
- ▶ French & German versions

SUPPORT

- ▶ Toll-free support hotline
- ▶ 24-hour electronic bulletin board
- ▶ International distribution and support
- ▶ Award-winning manuals
- ▶ On-site training & consulting

DATALEX

800-962-8888

From Canada 1-800-848-5548
FAX 415-362-5733

CIRCLE 917 ON READER SERVICE CARD

The Color Showcase
for Leading-Edge PC
Products and Services

DANCE OF THE PLANETS™

From eclipses to chaotic comets. Orbital simulation with great graphics—Space Travel for the Inquiring Mind.

"an order of magnitude better than any other s.s. simulator . . ."

John Mosley, *Sky & Telescope*

"Stunningly powerful . . . closest (to the beauty of the starry sky)"

Ed Mendelson, *PC Magazine*

IBM compatibles, EGA/VGA, \$195. Order/literature/sampler.

A.R.C. Software 303/663-3223 POB 1974P, Loveland CO 80539

CIRCLE 920 ON READER SERVICE CARD

BrainMaker
Neural Networks
give your PC
human skills.



"BrainMaker is the
most fascinating
computer software
I've ever seen."

John Dvorak
PC Magazine

Find patterns and hidden relationships in data and learn from the past. Read in data from Lotus, dBase, Excel, binary, and ASCII. Menus, dialog boxes, color, mouse support, great manuals. Stock and bond forecasting, pattern recognition, commodities, futures, and more.

30 day money back guarantee!

BrainMaker is \$195 Professional is \$795
Free Catalog: 800/284-8112, 916/477-7481
California Scientific Software

CIRCLE 921 ON READER SERVICE CARD



Super VGA Computer Images

1024x768x256
Photographic Quality Real Color Images

ASTRONOMY/NATURE/SCENIC
AND "OTHER" HEAVENLY BODIES!
FULL COLOR VIDEO MOVIES

Experience your computer's maximum graphics ability! 100's of GIF images for all computers, all resolutions up to 1024x768x256. We're the original, the leader, quality *MovieTrax*™, *MovieTrax*™. Use our easy "900" BBS numbers and your modem.

32 LINE COMMERCIAL KBS
Immediate, Full Access!
1-900 988-1000

What Rate 50 cents a minute



Actual computer screen images

Event Horizons
311 Ave B, Suite 202
Lafayette, CA 97034
Information: 503-667-7768



CIRCLE 922 ON READER SERVICE CARD



Slides From Your PC Try Us FREE!

We want your business. And we'll prove it! We offer the best service available. Experts in Harvard, Freelance, Corel and others on staff to serve you. Free Federal Express shipping. Toll-free Customer Service. And if you should make a mistake, we'll reshoot your slides, free. Call today, and say "I'd like to try your service. Free."

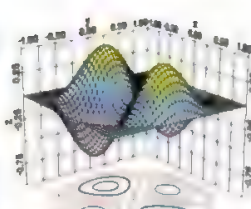
1-800-222-2592

Accent Presentations, Inc.

12780 High Bluff Drive, Ste. 250 • San Diego, CA 92130

CIRCLE 923 ON READER SERVICE CARD

Graphic™ 6.0



"All of the C language routines you need to write an impressive scientific graphing program of your own. Highly recommended"
PC Magazine

New Features

- Shaded contour plots
- Color PostScript
- Export HPGL/2 and TIFF
- TIGA and 8514 support
- Simultaneous plots
- European characters
- Polar contour plots
- Error function plots
- Color separations

Licensed for personal use only

Order now - \$465

Visa & MasterCard

Scientific Endeavors

508 N. Kentucky St.

Kingston, TN 37763

CIRCLE 924 ON READER SERVICE CARD

Mailing List Management



Discover how you can professionally manage your mailing list on your IBM compatible PC and save money with **ArcList** and **AccuMail**, two powerful, easy-to-use programs that offer you: address correction and standardization, duplicate recognition, list merge/purge, postal presorts, file maintenance, label design and printing, and more.

Boost your mailing list's deliverability and performance! For a FREE BROCHURE, call (800) 368-5806.

CIRCLE 925 ON READER SERVICE CARD

Sourcer - 486 - Commenting Disassembler

Sourcer creates commented source code and listings from memory, COM, or EXE files. It helps you understand the inner details of how programs work. With the BIOS Pre-Processor, generate commented listings of all your BIOS ROMs. \$169.95

"Sourcer is the best disassembler we've ever seen!" - PC Magazine.

ASM Checker - Locates Coding Problems

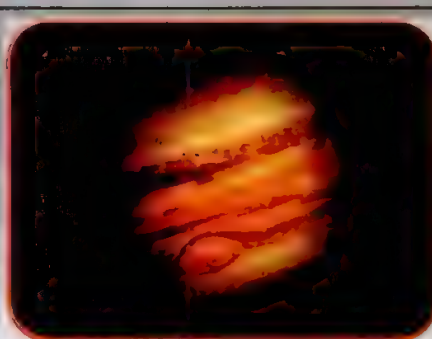
ASM Checker automatically locates common coding errors in assembly source code. By identifying errors that are often hard to find and easily overlooked, it saves you countless hours of debugging time. It also cross-references external and public symbols and identifies unused symbols and type mismatches. \$179.95

- **ASMITool 486™** - Creates flowcharts and procedure call diagrams \$199.95
- **View-It™** - Super fast file viewer - see 132 columns on screen \$69.95
- **Unpacker™** - Unpacks packed EXE files, interrupt viewer, and more \$39.95
- **ASM ProPak III™** - Includes all six products above (Save over \$100) \$549.70

Shipping & Handling: \$6 Canada/Mexico \$10, Other \$18 CA residents add sales tax. VISA/MC/AMEX

V Communications, Inc. Call 1-800-648-8266

4320 Stevens Creek Blvd Suite 275 Dept PC San Jose, CA 95129 408 296.4224



Zoom in on breathtaking views from our solar system and of deep space.

EZCosmos 3.0

Using its unique Skyplot, EZCosmos displays more than 10000 celestial objects, including the sun, moon, planets, stars, constellation lines and deep space objects. Find any object and a pop-up window displays its constellation name, common name, magnitude, right ascension and declination, altitude and azimuth, and rise and set times.

Zoom in on binary stars. Verify historical observations. Watch solar eclipse animations. Restrict the skyplot to display just the navigational stars. View the names of the brighter stars and all 88

constellations on the screen, and print your star chart on any dot-matrix or laserjet printer.

EZCosmos 3.0 gives you the universe for only \$69.95. It's available at your favorite software store, or you may order directly from Future Trends Software.

For more information, call:
800-869-3279 - Sales
214-224-3288 - Int'l Sales
214-224-3279 - VOX/FAX
or write to:

Future Trends Software, Inc.
1601 Osprey Dr. Suite 102
Desoto, TX 75115

© 1991 Future Trends Software

EZCosmos is a trademark of AmigaSoft, Inc.

CIRCLE 927 ON READER SERVICE CARD

STATISTICA

CSS/3™ Complete Statistical System with data management and over 1,000 fully integrated presentation-quality graphs; the largest selection of statistics graphics available in one package; unlimited size of files; menus mouse or commands; IBM compatibles; \$595.

Quick CSS™ All basic statistical modules of CSS 3 (incl. data management) and the full presentation-quality graphics capabilities of CSS 3; IBM compatibles; \$295.

CSS:GRAPHICS™ The largest selection of graphs in one package; all graphics capabilities of CSS 3 and, in addition, extended on-screen drawing facilities, inseting, multigraphs, rotating 3D graphs (30 types) with interactive cross sections; special effects; custom designed graphs; IBM compatibles; \$495.

STATISTICA™ A fully integrated system that combines all the capabilities of CSS 3 and CSS:GRAPHICS into a single, extremely comprehensive data analysis package; IBM compatibles; \$795.

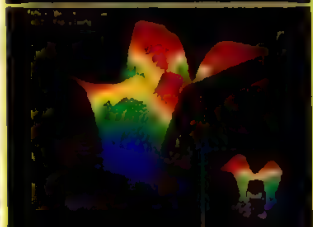
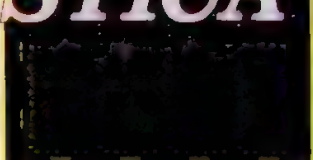
STATISTICA/Mac™ A CSS-compatible data analysis and graphics system with data management for the Macintosh (large selection of rotating 3D graphs, on-screen drawing); unlimited size of files; Macintosh computers; \$395.

Domestic shipping \$7. 14-day money-back guarantee

StatSoft™

2325 East 13th - Tulsa, OK 74104
(918) 583-4148 • FAX (918) 583-4376

StatSoft of Europe (Hamburg, Germany)
040-420034 • StatSoft UK (London, UK)
0462 482822 • StatSoft Pacific (Melbourne, Australia) 611-466-1766



CIRCLE 930 ON READER SERVICE CARD



LABEL MASTER

Print Perfect Labels and Forms In-House
On Almost Any Printer

- WYSIWYG layout • Money back guarantee
- Supports matrix, laser, thermal printers
- Supports most bar codes and text fonts
- Supports graphics images
- Label Master \$479 • Quick Draw \$259
- Developers library with source \$389

THE COMPUTER CONNECTION

PO Box 634 • Eau Claire WI 54702
715 833 2331 • Fax 715 833 1995

(800) 552-2331



CIRCLE 938 ON READER SERVICE CARD

LIMELIGHT

Is where you'll be
with over 786,000+ brand specifications
after your colorful ad runs here.

Call 1-800-825-4237

DON'T BE BLUE.

Don't think you can't afford
to target over 786,000+ PC buyers
here in color. You can.

Call 1-800-825-4237

The Color Showcase
for Leading-Edge PC
Products and Services

HARDWARE/ADD-ON-BOARDS

MEMORY UPGRADES - NEW PRODUCTS

IBM PS/2 Memory

2,4Mb Modules -- Models P-75,90,95
2Mb Upgrade --- Model 25/286

IBM RISC 6000 Memory

16, 32Mb Upgrade --- Models 320,
520, 530, 550,730, 930

IBM PS/2 CPU Upgrade

386T SX™16MHz -- Models 50 & 60

COMPAQ Memory

1, 4Mb Modules ----- LTE386s/20
1, 2, 4Mb Modules ----- SLT386s/20

AST Memory

8Mb Kit ----- Premium 486/33
1, 4Mb Modules ----- Premium Exec.
1, 4Mb Modules ----- Premium II
2, 4Mb Modules ----- Bravo 486/25
1, 4Mb Modules ----- Cupid Mem Brd

CANON Laser Printer

1, 1-2, 4Mb Modules ----- LBP-4
1, 2, 3Mb Modules ----- LBP-8III

OKIDATA OKILaser

1, 1-2, 4Mb Modules ----- LBP-4
1, 2, 3Mb Modules ----- LBP-8III

PANASONIC Laser Printer

1, 2Mb Modules ----- 4420 4450I

Toshiba Memory

1, 2Mb Modules ----- T1000LE
8Mb Upgrade ----- T5200,T8500

HP 9000 (APOLLO)

4, 8, 16, 32Mb Kits ----- 400 Series
DATA GENERAL AVIION

4, 8, 16Mb Kits - Terminals & Servers

SILICON GRAPHICS

32Mb Kit ----- IRIS Power Series

SIGMA DATA

Scituateville Row • P.O. Box 1790 • New London, NH 03257
Established - 1980 NH (603)526-6909 FAX (603)526-6915

TOLL FREE

800-446-4525

5-YEAR WARRANTY! - 30-DAY MONEY BACK GUARANTEE

IMMEDIATE DELIVERY! - 24-HOUR REPLACEMENT

VISA, MC, AMEX, COD, Qualified PO's

CIRCLE 751 ON READER SERVICE CARD

Memory - Laser Printer - Memory - Laptop - Memory -

4MB Capacity Expandable Memory Board :

- HP LaserJet II,IIID,IIIP,III and IIID
- Panasonic 4420, 4450I and 4450
- IBM 4019 and 4019E
- OKIDATA Okilaser 400/800
- EPSON EPL-6000, Toshiba PageLaser6

1/2/4MB Memory Upgrade for Notebook:

- Toshiba T1000SE/XE/LE
- Toshiba T1200XE
- Toshiba T2000SX
- Compaq LTE/286
- Compaq LTE/386

EXP Computer, Inc. 516-496-3703 Fax 516-496-2914

CIRCLE 752 ON READER SERVICE CARD

COMPUTER SYSTEMS

AMI 386/486 CACHE MOTHERBOARDS

You deserve the absolute BEST! Forget MYLEX & the rest.
ISA & EISA! PC Magazine May 1989 proved AMI is the BEST!
We are the largest AMI reseller! BEST price guarantee!

INTEL Inboard 386/PC 1MB PIGGY-BACK SPECIAL \$299
80387-16-\$289 20-\$335 80287-8-\$149 10-\$185 80C287A-\$249

PC WEEK Rated Cyrix #1 80387-25 \$399 80387-33 \$479

MAXTOR & Microscience Drive Bundle
ESDI 80MB w/Ultrastor Controller \$549

PC PROS 708/810-1010 FAX 9490
8205 S. CASS AVE. DARIEN, IL 60559

CIRCLE 756 ON READER SERVICE CARD

AMI 386/486

Mother Board Specials This Week

	4MB	8MB
AMI MK III 386-25	64K Cache 486 Converter	\$1190 \$1390
AMI MK II F4 386-33	64K Cache	1390 1590
AMI MK IV Screamer	64K Exp	1690 1890
386-33	256K Cache	2690 2890
AMI Voyager 486-25	128K Cache	3290 3490
AMI Voyager 486-33	128K Cache	3290 3490
Microscience 386-25	64K No Cache	990
Microscience 386-33	at 64K	1390 1590
64K Cache, ide, 2x1p ports		
Microscience 486-25	ISA 64K Cache	2490 2690
AMI/Microscience ISA	486-25/33	CALL CALL

USM - PIXEL Ultimate VGA-1MB
1024x768, 256 Colors Best For
Windows 3.0, WP 5.1, AutoCad \$175

FOR BEST PRICE PERFORMANCE SYSTEMS - CALL USM

USM 415-623-9040 (DAN) 415-952-5885 (RAMON)
DISTRIBUTORS 714-255-0113 (GEORGE) 408-980-0602 (BRIAN)

CONNER

CP3044	40 MB	\$299
CP3184	80 MB	469
CP3104	100 MB	499
CP3204	200 MB	799
MAXTOR, CDC		CALL

COMPLETE SYSTEMS
FAX OR
CALL YOUR
CONFIGURATION
FOR THE BEST PRICE

CIRCLE 757 ON READER SERVICE CARD

CD-ROM

CD-ROM / WORM / ERASABLE

Multi-Media Products
LAN Support
OS/2, Unix, Xenix Support
Computers, Peripherals, Accessories

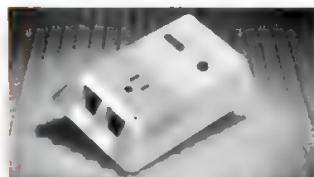
CD-ROM Workstations from...\$1,299
CD-ROM Drives from...\$499
CD-ROM Bundles from...\$699

GSAP GS00K90AGS5317

call for free catalog
1-800-MEGABYTE
Phone: 212-737-8400
Fax: 212-737-8289

COMPACT
DISK
PRODUCTS

223 East 65th Street, New York, NY 10028
CIRCLE 755 ON READER SERVICE CARD



REMOTE ACCESS

Office & Home Computers
Network/Server - Remote Booting
• Call in & activate computer On or Off with touch-tone code
• To be available with any computer configuration
• PC data backup, save and go - stored on 2MB & 4MB
• Compatible with all major operating systems and software
• Additional PC's, terminals, printers, modems available
• 24 Hour Ordering
1-800-266-1733 EXT. 140
Van Systems, Inc. 5212 Ave. R, Bldg. 9 Aqueduct, CA 94021

CIRCLE 754 ON READER SERVICE CARD

To place your ad in
PC MAGAZINE Classified
Call (212) 503-5115
or (800) 825-4ADS

Did you know...

PC Magazine is exclusively read by over
786,041* business buyers and brand
specifiers, including 90,000 computer
resellers and consultants.

ONE YEAR
WARRANTY

AMT INTERNATIONAL

LOWEST
SAME DAY
SHIPPING

2393 QUME DRIVE, SAN JOSE, CA 95131

(408) 432-1790 • (408) 432-0552 Fax: (408) 944-9801

COMPUTER SYSTEMS

AMT 486-25 MHz w/128K Cache

1MB RAM
90 MB SCSI HARD DISK
MATH Co-PROCESSOR SOCKET
1:1 2HD/FD CONTROLLER
1.2 OR 1.44 FLOPPY DRIVE
I/O 2S/P/G/ PORT
101 KEY BOARD
FULL TOWER CASE
w/230 P/S
SUPPORT UNIX, XENIX,
DOS, OS/2, NETWORK

\$2899

AMT 386-33 MHz w/64K Cache

1MB RAM
40 MB HARD DISK
INTEL 386-33 MHz CPU
MATH Co-PROCESSOR SOCKET
1:1 2HD/FD CONTROLLER
1.2 OR 1.44 FLOPPY DRIVE
I/O 2S/P/G/ PORT
101 KEY BOARD
MINI-TOWER CASE w/200 P/S
SUPPORT UNIX, XENIX,
DOS, OS/2, NETWORK

\$1399

AMT 386-25 MHz w/40 MB Hard Disk

1MB RAM
40 MB HARD DISK
INTEL 386-25 MHz CPU
MATH Co-PROCESSOR SOCKET
1:1 2HD/FD CONTROLLER
1.2 OR 1.44 FLOPPY DRIVE
I/O 2S/P/G/ PORT
101 KEY BOARD
AT CASE w/200 P/S
SUPPORT UNIX, XENIX,
DOS, OS/2, NETWORK

\$1249

AMT 386SX-16 MHz w/40 MB Hard Disk

1MB RAM
40 MB HARD DISK
INTEL 386SX-16 MHz CPU
MATH Co-PROCESSOR SOCKET
1:1 2HD/FD CONTROLLER
1.2 OR 1.44 FLOPPY DRIVE
I/O 2S/P/G/ PORT
101 KEY BOARD
AT CASE w/200 P/S
SUPPORT UNIX, XENIX,
DOS, OS/2, NETWORK

\$1045

**COMPUTER SYSTEMS: VGA MONITOR AND VGA
16 BIT CARD (1024 x 768) \$445**

MEMORY UPGRADES

COMPAQ MEMORY

DeskPro 286-E, 386-20/20E/25		
1MB	113131-001	\$139.00
4MB	113132-001	\$369.00
DeskPro 286N, 386N and 386SX		
2MB	118689-001	\$225.00
4MB	118690-001	\$590.00
DeskPro 386S		
1MB	113646-001	\$139.00
4MB	112534-001	\$369.00
DeskPro 386-33, 486-33 & SystemPro		
2MB	115144-001	\$225.00

AST MEMORY

Bravo-286, Workstation		
512K Kit	500510-010	\$59.00
2MB Kit	500510-002	\$172.00
Premium 386-16/20C		
1MB Kit	500510-007	\$96.00
4MB Kit	500510-008	\$369.00
Premium 386-20		
1MB Kit	500510-003	\$150.00
4MB Kit	500510-004	\$369.00
Bravo-386SX		
2MB Kit	500510-002	\$172.00
4MB Kit	500510-008	\$369.00
Premium 386-SX/25/33 & 486-25		
1MB	500718-002	\$80.00

HEWLETT-PACKARD MEMORY

Vectra QS/16S		
1MB	D1540A	\$112.00
4MB	D1542A	\$349.00
Vectra QS/20PC, RS/25PC and 20C		
1MB	D1640A	\$126.00
4MB	D1642A	\$365.00
Vectra 486PC		
1MB	D2150A	\$115.00
4MB	D2151A	\$390.00

IBM PS/2 MEMORY

Models 30-286, Exp. Board 1487258		
512 K Kit	30F5348	\$54.00
2MB Kit	30F5360	\$175.00
Models 70-E61/121, 55SX, 65SX		
1MB	6450603	\$95.00
Models 70-E61/121, 50Z, 55SX, 65SX		
2MB	6450604	\$179.00
Models 55SX, 65SX, 34F3077 & 34F3011		
4MB	34F2933	\$485.00
Models 70-A21		
2MB	6450608	\$170.00
Models 80-141		
1MB	6450375	\$145.00
Models 80-111/311		
2MB	6450370	\$269.00
All Models 70 and 80		
2-8MB w/2M	6450605	\$499.00
2-14MB w/2M34F3077		\$599.00
2-16MB w/4M34F3077		\$999.00
Models 50, 50Z, 55 SX & 60		
2-8MB	1497258	\$599.00

LASER PRINTER MEMORY

Hewlett-Packard Laser Jet IIP & II		
1MB	33474B	\$130.00
2MB	33475B	\$150.00
4MB	33477B	\$199.00
Hewlett-Packard Laser Jet IIP & II		
1MB	33443B	\$135.00
2MB	33444B	\$150.00
4MB	33445B	\$199.00
IBM Laser 4018 and 4018e		
2MB	1039137	\$369.00
3.5MB	1038675	\$469.00
Canon LBP-8II, 8MR, 8MT		
2MB	S63-1880	\$225.00
4MB	Part #N/A	\$439.00

LAPTOP AND PORTABLE MEMORY

TOSHIBA MEMORY		
1MB	Model 1000SE/XE	\$329.00
2MB	Model 1000SE/XE	\$469.00
2MB	Model T1200XE	\$289.00
2MB	Model T1600	\$289.00
2MB	Model T3100E	\$175.00
2MB	Model T3100SX	\$175.00
4MB	Model T3100SX	\$689.00
2MB	Model T3200SX	\$175.00
4MB	Model T3200SX	\$689.00
2MB	Model 5100	\$289.00
2MB	Model T5200, T8500	\$185.00
8MB	Model T5200, T8500	\$1300.00
ZENITH MEMORY		
1MB	SuperSport 286 & 286E	\$199.00
2MB	SuperSport 286 & 286E	\$455.00
2MB	SuperSport SX/Alpha	\$455.00
4MB	SuperSport SX/Beta	\$455.00
COMPAQ MEMORY		
1MB	Portable LTE 286	\$195.00
2MB	Portable LTE 286	\$299.00
1MB	SLT-286	\$245.00
4MB	SLT-286	\$1395.00
NEC MEMORY		
1MB	Prospeed 286	\$270.00
2MB	Prospeed 386	\$450.00
ZENITH MEMORY		
Zenith Z-386/20/25/33 & 33E		
1MB	ZA38/3800ME	\$99.00
4MB	ZA3800MK	\$675.00
Zenith Z-386/20/25 & 33		
2MB	ZA3600ME	\$199.00
Zenith Z-386 SX		
2MB	Z-605-1	\$255.00

MATH COPROCESSORS

INTEL	
8087-5MHz	\$80.00
8087-2 8MHz	\$116.00
8087-1 10MHz	\$155.00
80287-6 6MHz	\$130.00
80287-8 8MHz	\$185.00
80287XL 8/10MHz	\$185.00
80287XTL 12 MHz (Laptop)	\$210.00
80287-10 10MHz	\$185.00
80C287-12 12MHz	\$195.00
80387SX-16	\$285.00
80387SX-20	\$310.00
80387DX-20	\$340.00
80387DX-25	\$425.00
80387DX-33	\$525.00
WEITEX	
3167-20 20MHz	\$300.00
3167-25 25MHz	\$350.00
3167-33 33MHz	\$500.00
4167-25MHz	\$800.00
4167-33MHz	\$1050.00
CYRIX	
83087-16 16MHz	\$260.00
83087-20 20MHz	\$295.00
83087-25 25MHz	\$360.00
83087-33 33MHz	\$440.00
83SX87-16 16MHz	\$235.00
83SX87-20 20MHz	\$260.00
IT	
8C87-8	\$165.00
8C287-10	\$175.00
8C287-12	\$200.00
8C287-20	\$230.00
8C387-20	\$265.00
8C387-25	\$350.00
AMD	
80C287-10	\$110.00
80C287-12	\$130.00

DRAM

DRAM 1MGX1		
1 MGX1-120NS	\$5.00	
1 MGX1-100NX	5.25	
1 MGX1-80NX	5.50	
1 MGX1-70NX	5.75	
1 MGX1-60NX	7.50	
DRAM 64X4		
4164-15	\$1.50	
4164-12	1.99	
4164-10	2.50	
DRAM 256X4		
256X4-120NS	\$5.00	
256X4-100NS	5.50	
256X4-80NS	5.75	
DRAM 256X1		
256X1-150NS	\$1.79	
256X1-120NS	1.99	
256X1-100NS	2.00	
256X1-80NS	2.25	
256X1-70NS	2.35	
256X1-60NS	3.99	
DRAM 256X4		
256X4-120NS	\$5.00	
256X4-100NS	5.50	
256X4-80NS	5.75	
DRAM 256X1		
256X1-150NS	\$1.79	
256X1-120NS	1.99	
256X1-100NS	2.00	
256X1-80NS	2.25	
256X1-70NS	2.35	
256X1-60NS	3.99	

SIMM MODULES

IBM TYPE	
256x9-10	18.00
256x9-80	18.00
256x9-60	23.00
APPLE-MAC	
1Mb-80	60.00
1Mb-10	45.00
1Mb-80	49.00
1Mb-70	51.00
256x9-70	20.00
4x8-80	\$250.00

MICRO- PROCESSORS

68020 16MHz	\$129.00
20MHz	169.00
25MHz	179.00
33MHz	199.00
68030 16MHz	129.00
25MHz	199.00
68010 16MHz	80.00

CPU CHIPS

80386DX-16	\$250.00	80286-8 (PLCC)	15.00
80386DX-20	275.00	80286-10 (PLCC)	18.00
80386DX-25	325.00	80286-12 (PLCC)	20.00
80386DX-33	355.00	82385-20	60.00
80386-16	230.00	82385-33	75.00
80386-20	235.00	V-20-8	6.00
80486DX-25 (B6)	650.00	V-20-10	10.00
80486DX-33 (B6)	1150.00	V-30-10	10.00

COMPUTER SYSTEMS

486-33 MHz CACHE

Since 1985, MSE has been dedicated to bringing you high-quality American designed, engineered and built computer systems for a wide range of applications. NOW, for our 6th year anniversary special, we are proud to introduce our fastest and most powerful machine, the #0486-25MHz or 33MHz.

MicroCache 386 \$1995

- Intel 80386-33MHz CPU
- 200MB Fast Dr. (15ms)
- Enhanced Keyboard
- 385-33MHz CACHE Controller
- 1.2MB Floppy Dr.
- 58.5MHz Landmark
- 4MB RAM, expands to 32MB
- 2 Serial Parallel
- 128K Cache Option

MicroCache 486-25MHz

- 80486 25CPU 4MB RAM
- 1.2MB Floppy Dr.
- 125MB Fast Dr. (18ms)
- 64K Cache (25ns)
- Enhanced Keyboard
- 486-33MHz Option

\$2295

MicroCache 386SX-20MHz

- 386SX 20 CPU 1MB RAM
- 1.2MB Floppy Dr.
- 84MB Fast Dr. (18ms)
- Serial Parallel
- Enhanced Keyboard
- 30MHz Landmark

\$1095

Motherboard Special

- 386SX-16MHz W 1MB RAM \$399
- 386SX-20MHz W 32K Cache 1MB RAM \$499
- 386-33MHz W 64K Cache 4MB RAM \$999
- 486-25MHz W 64K Cache 4MB RAM \$1599
- 486-33MHz W 64K Cache 4MB RAM \$1999



Micro 386SX-16MHz

- 80386 CPU 1MB RAM
- 1.2MB Floppy Dr.
- 42MB Fast Dr. (22ms)
- Serial Parallel
- Enhanced Keyboard
- 20MHz Landmark

\$895

SALES HOURS:

Monday - Friday
9:00 AM - 5:30 PM
Saturday
10:00 AM - 3:00 PM
PST

MS ENGINEERING, INC.

10601 S. De Anza Blvd., Suite 214
Cupertino, CA 95014
(408) 257-4249 FAX: (408) 257-4398

CIRCLE 759 ON READER SERVICE CARD

EXSEL DIRECT

1-800-624-2001

In NY: 716-272-8770

Refurbished IBMs!

XT 10MB HD, 640K RAM	\$399
XT 20MB HD, 640K RAM	549
AT 20MB HD, 640K RAM	799
AT 30MB HD, 640K RAM	999
AT 60MB HD, 2MB RAM	899
PS/2 25 MONO	549
PS/2 25 20MB HD	699
PS/2 25 COLOR	799
PS/2 30-021 80286	799
PS/2 30-E21 80286	1249
PS/2 30-E31 80286	1349
PS/2 50-021 80286	1199
PS/2 50Z-031 80286	1399
PS/2 50Z-061 80286	1699
PS/2 55SX 80386 SX	CALL
PS/2 60-041 80286	1699
PS/2 60-071 80286	1799
PS/2 70-E61 80386	2699
PS/2 70-061 80386	2799
PS/2 70-121 80386	3199
PS/2 80-041 80386	2699
PS/2 80-071 80386	2999
Compaq Deskpro 386	1999

Call for custom configuration.

EXSEL INC.
THE ALTERNATIVE TO IBM

2200 Brighton Henrietta Townline Rd
Rochester, NY 14621

All units refurbished with 90 Day Warranty, VISA, MasterCard, prepayment, C.O.D. certified accepted. Prices Subject to Change.

CIRCLE 760 ON READER SERVICE CARD

Rent From The Leader.



The Professionals in Computer Rentals

1-800-922-8646

Locations
Nationwide

Each Franchise is independently owned & operated. Franchise Opportunities Available.

CIRCLE 761 ON READER SERVICE CARD

USED PC's! BOUGHT & SOLD!

- WE BUY USED PC'S AT TOP DOLLAR!
- WE SELL REFURBISHED PC'S CHEAP!
- MOST BRANDS. CALL FOR QUOTE!

RENTX INC., BOSTON, MA
(800) 545-2313 or (617) 423-5567

CIRCLE 762 ON READER SERVICE CARD

DISKETTES

MAXELL • SONY VERBATIM • BASF

100% CERTIFIED LIFETIME WARRANTY

5 1/4" DS/DD	\$.39 each
5 1/4" DS/HD	.59 each
3 1/2" DS/DD	.59 each
3 1/2" DS/HD	1.04 each

PREFORMATTED • COLORS • TAPES

800-222-0490

In NJ 201-462-7628 FAX 201-462-5658

• 24 Hour Shipment •

MEGA Soft

PO Box 710, Freehold, NJ 07728

CIRCLE 766 ON READER SERVICE CARD

BUY A BETTER BULK DISKETTE

NAME BRAND BULK			
	100	200	
VERBATIM			
5.25 DS/DD	.28c	.27c	
5.25 HD	.52c	.50c	
SONY			
3.5 DS/DD	.50c	.49c	
3.5 HD	\$1.19	\$1.16	

PREMIUM GENERIC			
100% CERTIFIED, HIGH QUALITY			
	100	200	
5.25 DS/DD	.24c	.23c	
5.25 HD	.38c	.37c	
3.5 DS/DD	.39c	.38c	
3.5 HD	.79c	.78c	

100% GUARANTEED

media source SINCE 1986

800-356-2553

FAX (404) 952-1432

CIRCLE 767 ON READER SERVICE CARD

SAVE SAVE SAVE SAVE SAVE SAVE LAPTOP SPECIALS AND LOW, LOW PRICING

LATEST LAPTOP MODELS

TOSHIBA • ZENITH • NEC • COMPAQ
SHARP • TI • EPSON • PANASONIC
BONDWELL • FORA • SAMSUNG

Call for availability on other models.
Convenient one-stop shopping for all your laptops,
accessories and upgrades!

ORDER BEFORE 3:00 P.M. FOR SAME-DAY SHIPPING
NEXT-DAY DELIVERY AVAILABLE
OPEN MON-FRI 9AM-9PM EST SAT 9AM-5PM
FAST, FRIENDLY & DEPENDABLE SERVICE

COMPUTER OPTIONS UNLIMITED

12 Madison Lane
Bound Brook, NJ 08905
201-469-7678

LOW PRICES FROM THE LAPTOP SPECIALISTS
1-800-424-7678 TO ORDER

SAVE SAVE SAVE SAVE SAVE SAVE
CIRCLE 763 ON READER SERVICE CARD

XT CLONE 10MHz 640K 20MB MONO SYS	\$599
286 12MHz 1MB RAM 40MB MONO SYS	\$734
386SX 16MHz 1MB RAM 40MB VGA SYS	\$1275
386 25MHz 4MB RAM 80MB VGA SYS	\$1838
486 25MHz 4MB RAM 100MB VGA SYS	\$2912
SEAGATE ST-251-1 40MB 28MS HD	\$229
SEAGATE ST-4006 80MB 28MS HD	\$495
SEAGATE ST-1144A 124MB IDE 3 1/2" 19MS	\$569
MITSUBISHI MR535 60MB RLL 28MS HD	\$255
W. DIGITAL WD-93044A 40MB IDE AT 28MS	\$219
WD CAVIAR WD-AC-28032R 80MB IDE 1" 18MS	\$489
CONNER CP3044 42MB IDE AT 25MS HD	\$299
CONNER CP3184 84MB IDE AT 25MS HD	\$459
CONNER CP3104 103MB IDE AT 25MS HD	\$489
CONNER CP3204 210MB IDE AT 19MS HD	\$799
FUJITSU 1 2MB FLOPPY DRIVE 5.25"	\$58
FUJITSU 1 44MB FLOPPY DRIVE 3.5"	\$59
FUJITSU 101 CLICK KEYBOARD 4700	\$42
MANAG 90705 90701 90801 3400	CALL

DMC
1234 South St.
Long Beach, CA
90805
Tel: (213) 422-4444
Fax: (213) 422-7676
& 422-6643

CIRCLE 764 ON READER SERVICE CARD

To place your ad in

PC MAGAZINE

Classified

Call (212) 503-5115

or (800) 825-4ADS

DISKETTES

Quality Diskettes diskettes plus Next Day Shipping

1-800-289-2839

ALL PRODUCTS 100% GUARANTEED

5 1/4" DS/DD 48TPI	Special!	5 1/4" DS/HD 48TPI
25c ea	3 1/2" DS/HD 1.44 MB	69c ea
25c IN LOTS OF 50 USER LABEL \$1.50 per 50 50% OFF 10c per 50 50's	HIGHEST QUALITY OFF \$1.00 per 100	5 1/4" DS/HD 39c ea
3 1/2" DS/DD 135TPI		39c ea
39c ea		39c ea
39c IN LOTS OF 50 USER LABEL \$1.50 per 50 50's		39c ea

10105 E. Via Linda, Suite 103-395 Scottsdale, Arizona 85258

CIRCLE 765 ON READER SERVICE CARD

PC CLASSIFIED

EXPANSION UNITS

CALL DRAM CO.

For the best DRAM products
prices & service!

- Free Shipping
on orders over \$300.00
- 100% Guaranteed
- 1 Year Warranty
on all products
- Volume Discounts Available
- P.O. Welcome
- 2% Visa MC surcharge
- C.O.D. Cash Co. Co. OAC
- Prices subject to change
- Please call for current prices

GRAMS	
1MEG X 1 100NS	\$4.95
1MEG X 1 80NS	\$5.10
1MEG X 1 70NS	\$5.25
1MEG X 1 60NS	\$6.15
256K X 1 80NS	\$1.85
256K X 1 120NS	\$1.70
256K X 1 100NS	\$1.85
256K X 1 80NS	\$2.00
256K X 1 70NS	\$2.20
256K X 1 60NS	\$2.40
64K X 4 80NS	\$2.00
64K X 1 120NS	\$1.60
64K X 1 100NS	\$1.75

IBM Type SIMMS	
1MEG X 9 100NS	\$225.00
1MEG X 9 100NS	\$48.00
1MEG X 9 80NS	\$50.00
1MEG X 9 70NS	\$53.00
1MEG X 9 60NS	\$61.00
256K X 9 100NS	\$16.00
256K X 9 80NS	\$17.00
256K X 9 60NS	\$21.00

PS/2 Type SIMMS	
6450603 1MEG	\$85.00
6450604 2MEG	\$128.00
6450608 2MEG	\$145.00
30F5348 512K	\$55.00
30F5352 2MEG	\$170.00

INTEL MATH CO-PROCESSORS

80287 8MHz	\$188.00
10MHz	\$205.00
XL	\$218.00
80387 16SX	\$288.00
20MHz	\$345.00
25MHz	\$345.00
33MHz	\$335.00

EXPANSION UNITS

HP LASERJET UPGDS
EVEREX EXP. BOARDS

ELNIX FASMATH CO-PROCESSORS

386 SERIES CALL

(415) 398-2987
(800) 488-DRAM
FAX (415) 398-5402

P.O. Box 590127, San Francisco, CA 94159-0127

CIRCLE 768 ON READER SERVICE CARD

MEMORY ICs !!!

4Mx9	80ns	\$220.00
PS2 2Meg simm		\$110.00
AST 1Meg simm		\$ 60.00
1Mx9	80ns	\$ 52.00
1Mx8	80ns	\$ 48.00
✓ 1Mx1	100ns	\$ 4.85
✓ 256x4	100ns	\$ 5.75
✓ 41256	120ns	\$ 1.85
✓ 41464	100ns	\$ 2.40
2800	80ns	\$ 2.75
4164	120ns	\$ 1.70

* Call for quantity discount, high-speed parts, SIPP
MATH CO-PROCESSORS
30287-23 \$430.00 30287-18 \$275.00
30287-25 \$360.00 30287-12 \$185.00
30287-28 \$380.00 30287-19 \$190.00
30287-16 \$350.00 30287-4 \$140.00
30287-23-25 \$299.00 V.20 MATH \$18.50

I.C. EXPRESS

15140 Valley Blvd. City of Industry, CA 91744
1-800-877-8188
FAX: (818) 369-1236 (Mon.-Fri. 9-5 PST)
CALL FOR CURRENT PRICES & VOLUME DISCOUNTS
Customer Service: (818) 332-8880 (Mon.-Fri. 10-3 PST)
Price Shown for Cash. Master/Amex/Visa add 3.00%
Prices are subject to change. Minimum order \$10.00
Shipping & Handling: UPS Ground \$8.00 Air \$12.00 (1 lb)
CIRCLE 769 ON READER SERVICE CARD

TERABYTE INTL

MOTHER BOARD	
386-33/54K CACHE	4MB \$1385 8MB \$1675 16MB CALL
386-25/64K CACHE	4MB \$1280 8MB \$1595 16MB CALL
386-25	1MB \$ 885 2MB \$1050 4MB \$1090
386SX-18	1MB \$ 485 2MB \$ 590 4MB \$ 740
MODEM	2400 BPS INTERNAL \$ 65.00
VGA CARD	512K 1024X768 \$135.00
AT/IO CARD	S/P/G OR MORE CALL
CASES	(WITH POWER SUPPLIES) CALL
D-RAMS	
64KX4	-10 \$ 3.50 80387 -33 \$545
256KX4	-10 \$ 2.20 80387 -25 \$445
1 MEGX4	-08 \$2.00 80387 -20 \$345
256KX4	-08 \$ 6.90 80387/SX \$1855
SIMMS & SIPP	
1 MEGX9	-80 \$CALL 80287/XL \$215
256X9	-80 \$22.00
CACHE MEMORY	
64KX8	-25 \$ 14

CALL FOR IBM PS/2 AST AND MORE
CALL FOR CURRENT PRICE & VOLUME DISC.

ORDER 800-688-BYTE
TERABYTE INTL INC.
20710 MANHATTAN PLACE #116 TORRANCE, CA 90501
TEL 213-787-9736 FAX 213-787-9735
PRICE SUBJECT TO CHANGE WITHOUT NOTICE
CIRCLE 770 ON READER SERVICE CARD

PRINTERS

ROM BIOS UPGRADES

Complete Upgrades For Your IBM or Compatible
ROM BIOS FEATURES

XT BIOS UPGRADES

AMI 286-XT BIOS \$4.95
Phoenix 286-XT BIOS \$4.95

AT 286 BIOS UPGRADES

AMI 286-AT BIOS \$9.95
Phoenix 286-AT BIOS \$9.95

AT 386 BIOS UPGRADES

AMI 386-AT BIOS \$9.95
Phoenix 386-AT BIOS \$9.95

IBM BIOS UPGRADES

AMI 386-IBM BIOS \$9.95
Phoenix 386-IBM BIOS \$9.95

KEYBOARD BIOS UPGRADES

AMI 286-386 KEYBOARD BIOS \$4.95
Phoenix 286-386 KEYBOARD BIOS \$4.95

COMPUTER UPGRADES

TL AMI 386-486 HARD DRIVE \$249.95
Memory Chip Upgrades \$9.95
AMI 386-486 BIOS \$4.95

UPGRADES ETC.

15822 N.E. 15TH ST. WOODBRIDGE, WA 98052
(800) 541-1943
(206) 882-3634
(206) 881-8294 - FAX

• 1-Year Warranty
• 30-Day Money-Back
• Authorized Stocking
• Free Catalog
• Corporate & University
• P.O.'s Are Welcome
CIRCLE 773 ON READER SERVICE CARD

ADOBE PACIFIC

DATA PRODUCTS
and other brands of

LaserJet Enhancements

- Lowest Prices Guaranteed
- See Our Full Page Ad in
Previous/Next PC Magazine

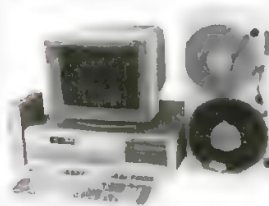
We Know What We Sell.

CALL
1-800-747-HPLJ
1-800-747-4755
1940 Cotner Ave.
Los Angeles, CA 90025
FAX: (213) 478-4770
Phone: (213) 479-4477

CIRCLE 774 ON READER SERVICE CARD

TAPE DRIVE SUBSYSTEMS

9-Track Tape Subsystem



Now you can exchange data files
between your IBM PC/XT/AT
and any mainframe or mini-
computer using IBM compatible
1600 or 6250 BP1 9-track tape.
Unit can also be used for disk
backup. Transfer rate is up to 4
megabytes per minute on PCs
and compatibles. Subsystems
include 7" or 10 1/2" streaming
tape drive, tape coupler card,
cables and software.

QUALSTAR

9621 Irondale Avenue
Chatsworth, CA 91311
Telephone: (818) 882-5822
CIRCLE 775 ON READER SERVICE CARD

PRINTERS

Hassle-Free Printer Sharing



SNAP
Transmitter \$59
(includes 25 ft. cable)

SNAP
Receiver \$69

Just attach a SNAP transmitter to the parallel port
of each PC, a receiver to the printer, and connect with
up to 1200 ft. of phone cable. As you add more PCs, simply
plug in more transmitters. No software! No training!

call 800/445-6190
to order your SNAP or to
receive our Free Catalog
VISA-MC, AMEX are accepted

ASP Computer Products, Inc.
1026 W. Maude Ave. suite 305
Sunnyvale, CA 94086
FAX: 408-746-2803

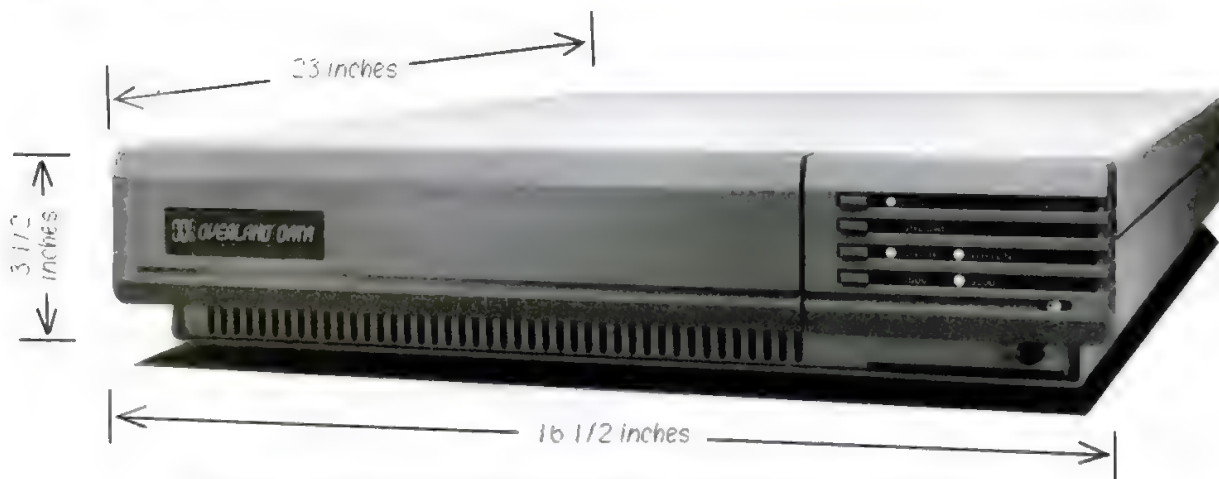
CIRCLE 772 ON READER SERVICE CARD

Did you know...

On average, PC Magazine's direct market purchasers have spent-

- \$30,000 on hardware
- \$5,400 on software
- \$2,100 on accessories
- an average of \$2,855 per order

Announcing an advance of very small proportions:



The OD3210, the smallest autoloading 9-track tape drive in the world.

It seems that every advance in computer technology results in products that are smaller and easier to use. Remarkably, 9-track tape drive manufacturers have managed to buck this trend, making you put up with heavy, noisy behemoths or drives you have to thread yourself.

To put an end to this backward thinking, Overland Data has designed and built the new OD3210. It's the first drive that's actually office friendly. Here are just a few of its advances:

- Actually portable at only 30 pounds.
- So quiet, you may forget it's on.
- Runs on only 45 watts (other drives average 200).



- Autoloading. Just slide the tape in the front. The OD3210 does the rest.
- Extremely reliable. No drive has fewer moving parts.
- Easy to use, with its front panel display and built in help cards.
- Warranted a full two years.
- Surprisingly affordable.

When you buy the OD3210, you get more than the most advanced tape drive in the world. You also get expert, toll free support, and the ODI Special Service Program. So call us. And find out why some of the best advances are the smallest ones.

1-800-PC9-TRAK

OVERLAND DATA
San Diego, CA

CIRCLE 776 ON READER SERVICE CARD

PC CLASSIFIED

TAPE DRIVE SUBSYSTEMS

SAVE ON 9 TRACK TAPE SYSTEM

FOR IBM PC/XT/AT
& PS-2



- Mainframe to PC Data Transfer
- High Speed Backup
- All Software, Complete System
- Service and Support, easy Installation

call (818) 343-6585 or write to:

CONTECH Computer Corp.
P.O. Box 182 Torrance, CA 91350

CONTECH

CIRCLE 777 ON READER SERVICE CARD

SOFTWARE/ACCOUNTING

MIP Fund Accounting System

Simply the best software for non-profit & governmental organizations since 1982.

Flexible Chart of Accounts • Automatic Offset & Interfund Balancing • Automatic Cost Allocations • Monthly Budgeting & Forecasting • Check, P.O., & A/R Bill Printing • Multiple Funds • Multiple Overlapping Fiscal Years • User Defined Reports • IBM PC/XT/AT Compatible • Single User or Network • User Installable

Modules: General Ledger, Budget Reporting, Accounts Payable, Encumbrances, Accounts Receivable, Database Interface, Payroll, Fixed Assets

1-800-647-3863

505 East Huntland Drive, Suite 340, Austin, TX 78752

dBASE ACCOUNTING TOOLS

*General Ledger
*Invoice & A/R
*Service Billing
*Job Costing
*Purch Ord/Inventory
*Bill of Materials
\$99 ea + s&h w/dBASE 3+ or 4 Source Code
DATAMAR SYSTEMS
8586 Miramar Place
San Diego, CA 92121
(619) 452-0044 MC, Visa, AX, CH, COD

PARADOX™ ACCOUNTING

Our package includes these choices in an integrated system, no modules. Checking, Invoicing, A/R, Purchasing, A/P, Inventory, General Ledger with full departments, Employee Sales tracking, Quattro/Quicken/123 Interface Demo \$35, Single-user \$150, Network \$395
MIKE OLMSTED, CPA
P.O. Box 19968
So. Lake Tahoe, CA 95731
(916) 544-6778

BUSINESS

High-end groupware.

At \$395 for up to 20 users,* and \$895 for more, OfficeMinder™ offers you the lowest-cost-per-user in the industry.

Yet OfficeMinder offers you more practical office capabilities. E-mail, Bulletin board, Address management, Schedule and Project management, To-Do lists, Person-In/Out board and much more.

OfficeMinder includes On-line help, Mouse support, Alarms, Dialer, mail Binders with folders and MHS compatibility.

Using less than 5k of RAM, one of the smallest groupware TSRs available.

Call 1-800-437-4492 today for a brochure and a FREE demo package. 30-day money back guarantee.

*Limited-time offer
\$395.
Regular price \$495

CSI

Century Software Incorporated
Woodridge Technology Park
310 N. Wilson Ave.
Woodland, Wisconsin 53097
414-673-4424 • FAX: 414-673-5112

**Low-end
price.**

CIRCLE 778 ON READER SERVICE CARD

What PC Magazine Classified is all about—

BIG CIRCULATION.

An astounding audience of 786,041* brand specifiers, more PC product buyers than any other publication delivers. Virtually every PC Magazine subscriber has the expertise and authority to specify brands of personal computers for their companies.

BIG SCOPE.

Advertising in PC Magazine Classified works in a big way. PC Magazine's enormous scope is one reason—but there are many other big reasons why advertising campaigns succeed in PC Magazine Classified.

PC Magazine Classified takes advertisers' volume sales message to the biggest audience, and supports that message in an editorial environment that encourages direct response buying.

BIG RESULTS.

PC Magazine Classified gets results. Advertising in PC Magazine Classified compels buyers to act, producing an average 16,462 inquiries per issue (an average 146 inquiries per advertiser per issue). Bottom line, PC Magazine Classified promotes active direct response spending, generating as much as \$200 million in sales revenue through the Classified section alone.

Want to start fully utilizing this gigantic marketing tool? Call your PC Magazine Classified Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

Source: Beta Research Study, 1988
*BPA Audit December, 1990

COMMUNICATIONS

MULTI-LINE PC-DOS BBS

The Bread Board System (TBBS) Secure reliable, full-featured commercial Information system for IBM and compatibles. Menu editor allows customization by nonprogrammers. Kermit, X & Y-Modem. High performance allows up to 32 simultaneous callers. Up to 38 400bps dBASE module available.

eSoft, Inc.
15200 E. Girard Ave. #2550
Aurora, CO 80014
(303) 699-6565

VIKING DATA ENTRY

Professional Quality Software

- Used by U.S. Census
- Advanced validation
- Sequential/ISAM files
- MS-DOS, UNIX, XENIX, VMS, AIX
- Technical support
- Re-key verify

Viking Software Services
4808 E. 67th St. Ste. 100
Tulsa, OK 74136
918-491-6144 FAX 918-494-2701

DIAGNOSTIC

PORT TEST

The most comprehensive serial & parallel port diagnostics available. Everything you need to test, debug, and manipulate ports—all in one program. Includes 3-way wrap plug. \$89.

TEST DRIVE.

A complete Floppy Disk Drive diagnostic program. Pass/Fail or detailed reports. Can be used to align drives. Supports 360K-5¼", 1.2M-5¼", 720K-1.44M-3½", \$115 for one format, \$215 for all three. Alignment disks included. Money back guarantee. VISA/MC. MicroSystems Development
4100 Moorpark Avenue M.S. 104
San Jose, CA 95117 USA
(408) 296-4000 FAX (408) 296-5877

PC Magazine Classified

is #1 in classified ad
lineage in IBM-Standard
computer publishing.
Join the winning team
and place your ad.

**Call (212) 503-5115
or (800) 825-4ADS**

DATA BASE

ANSI SQL DBMS FOR PROGRAMMERS, ONLY \$195

SUPPORTS - Turbo C • Turbo Pascal • Microsoft C • QuickBASIC • Micro Focus COBOL
All Compilers are trademarks of the respective Manufacturers

Ocelot SQL gives you everything you expect from a SQL Database. It is SMALL (needs only 320 KB RAM). FAST (written in assembly language). DB2 COMPATIBLE (conforms to industry standard). FLEXIBLE (runs embedded and stand-alone) and it includes REFERENTIAL INTEGRITY.

1(800) 755-1875

Single-user for Windows: \$195
Single-user for Borland Pascal/C: \$195
dBase with unlimited runtime: \$695
Multi-user for all languages: \$850
dBase with unlimited runtime: \$1850
S&M USAS CAN/AMX10.000/815 -CA add tax

SIENERSOFT, INC.
6540 Vista Blvd. Suite E
San Diego, CA 92121



CIRCLE 779 ON READER SERVICE CARD

DATA ENTRY

Replace dedicated data input systems
Front-end mainframe applications

KeyEntry III

- LAN or stand-alone environments
- ScreenPainter and MenuManager included
- Batch Control System and Reformat utility
- Spanish, German, and French versions
- Outstanding customer support
- Thousands of users worldwide
- OS/2 version

800-533-6879



FREE DEMO DISK
AVAILABLE!

SCS
SOUTHERN COMPUTER SYSTEMS, INC.
2229 131st Ave. N.E. #200
In Shreveport, LA 71203-4629 or FAX 504-773-3678

DATA ENTRY SOFTWARE

HEADS-DOWN data entry and TWO-PASS verification. Fast and powerful, of course, but more importantly, extremely easy to use. Paint the screen formatting in minutes. On-line help text, edit language, batch control.

PC from \$395
Also for LAN's.
IBM AS/400™
IBM S/36

FREE Trial

206/776-6443
800/356-0203



COMPUTER KEYES
21929 Makah Rd.
Woodway, WA 98020

DESKTOP PUBLISHING

WordProofer

Replace proofreading or document comparators with the faster, more accurate technique of two-pass proofing. Easier to learn and use than any word processor or desktop publishing program. Key, edit, or proof any file on your PC, then import to your application.

Single copy \$295
Multipcopy discounts
Network version
Free tech support



COMPUTER KEYES
21929 Makah Rd.
Woodway, WA 98020
206/776-6443
800/356-0203

DATA ENTRY

Why have over 85% of the largest companies in the U.S. selected the RODE/PC Data Entry System?

The answer will be obvious when you call for information and a free demonstration today.



DPX • 490 California Avenue
Palo Alto, CA 94306

CIRCLE 780 ON READER SERVICE CARD

ENGINEERING

SIMULATION

GPSS/PC is a full-power version of GPSS, the most popular mainframe simulation language. Specifically designed for interactive use on today's high-speed microprocessors, it is loaded with features such as interactive graphics and animation. Using GPSS/PC, you can predict the behavior of complicated real world systems.

MINUTEMAN SOFTWARE
P.O. Box 171/B
Sew, MA 01775
800-223-1430/508-897-5662 Ext 316

ENTERTAINMENT/GAMES

Adult VGA Software

Visualize the full potential of VGA and SVGA.

Hi-res. 256 color images

- Vol.1 Sexy (8 disks per vol.) \$13.95
- Vol.2 Nude \$13.95
- Vol.3 More Nude \$13.95
- Vol.4 Adults Only \$13.95

- Hi-res VGA animation. Just like the movies!!
- Vol. 5 Adult VGA Movies \$13.95
- Vol.11 Hot Italian Movies \$13.95
- Vol.12 Long Length Movies \$13.95

Special: Order 4 volumes, select 5th free!
Choose from six 5¼" DD disks, three 5¼" HD (best deal), three 3½" DD, or two 3½" HD for each vol. All disks are full. Vol. 12 available in only HD disks.

Get more great software for less. Guaranteed Fast service. Order today! Include \$3 S&H. Must state age 21 or over. Send check or MO to: Int. orders add \$3 US funds only. CJCware
For free catalog call: Station A, P.O. Box 2299
(217) 352-7430 Champaign, IL 61825

CIRCLE 784 ON READER SERVICE CARD

ENTERTAINMENT/GAMES

- #601 16 color \$14.88 256 color \$19.88
- #602 16 color \$14.88 256 color \$19.88
- #603 16 color \$14.88 256 color \$19.88
- #105 Includes all three disks: 601, 602 & 603
16 color \$37.88 256 color \$49.88

WINDOWS 3.0 VIEWER INCLUDED

READY TO USE BACKGROUNDS

Standard Windows VGA uses 16 Colors
some SVGA drivers use 256

And \$3.99 shipping & handling

Please include \$3 S&H

For more info

407-479-0588

STARWARE PUBLISHING CORP.
P.O. Box 340203 • DEPT. 22
BOCA RATON, FL 33434
Must state age over 21



CIRCLE 782 ON READER SERVICE CARD

Where Adults Come To Play! ODYSSEY BBS

- Local Numbers Covering 850 US Cities
- CB Style Group and Private Chat
- 1000's Of Shareware Programs
- Giant Message Forums
- Matchmaker Dating Database
- Interactive Multiplayer Games
- National Classified Ads

FOR FREE DEMO AND LOCAL NUMBER CALL

818-358-6968

BY MODEM MUST BE OVER 18 313/2400 8/7/91

CIRCLE 783 ON READER SERVICE CARD

Calling about an ad? Say you saw it in
PC Magazine Classified

ENTERTAINMENT/GAMES



SeXXy Software

Must Store
Age Over 21

SeXXy Disk #1 — An unbelievable visual erotic encounter — **MUST SEE!**
SeXXy Disk #2 — **NEW!** 3 Erotic encounter games for friends and lovers guaranteed to shed both clothes and inhibitions
SeXXy Disk #3 — An anatomical arcade game with unusual ammunition
SeXXy Disk #4 — 2 more incredible visual erotic encounters — impress your friends
SeXXy Disk #5 — Create your own erotic fantasies about friends and lovers
SeXXy Disk #6 — **NEW!** View, print or edit ten sizzling pictures including celebrities

\$7 each, any 3 for \$17, or all 6 for \$32.

for IBM & compat. CGA, EGA or VGA graphics req'd

ADD \$3 S/H • 3.5" or FOREIGN ORDERS ADD \$2 PER DISK • IN PA ADD TAX.

VISA/MC Orders only 800-243-1515 Ext. 600XX

24 HRS./7 DAYS • Or check/MO to SeXXy Software, 2880 Berkey Rd., Dept. 600XX, Hatfield, PA 19440

THE BEST IN ADULT SOFTWARE FOR LESS!!

SADDAM HUSSEIN TARGET GAME — Only \$15.00

Shoot Patriot Missiles at Actual Pictures of him as he yells at you! TRUE SOUND — As seen on TV News —

CGA & VGA included. Shipped FREE to Desert Storm Military!

CONNOISSEUR COLLECTION

ALL NEW! In 256 Color VGA!!

SeXXy Disk #CC1 — ★ YOU BE THE STAR ★
The FIRST CUSTOMIZABLE movie allows you to write the dialog and the title. You can star with the partner of your choice. Incredible scenes display with your dialog. ONLY AVAILABLE FROM US!

SeXXy Disk #CC2 — THE FIRST SOUND MOVIE!
The first computer erotic movie with SOUND. See the incredible 256 color VGA graphics while hearing the actual dialog. OURS EXCLUSIVELY!

SeXXy Disk #CC3 — THE BEST MOVIE!
The best computer movie available. Only for the serious collector. 256 stunning VGA colors.

1 Movie \$29, 2 Movies \$49, 3 Movies \$65
All CC Disks Require VGA monitor and hard disk — over 1 MB of action.

ADD \$3 S/H • 3.5" or FOREIGN ORDERS ADD \$2 PER DISK • IN PA ADD TAX.

VISA/MC Orders only 800-243-1515 Ext. 600XX

24 HRS./7 DAYS • Or check/MO to SeXXy Software, 2880 Berkey Rd., Dept. 600XX, Hatfield, PA 19440

THE BEST IN ADULT SOFTWARE FOR LESS!!

SADDAM HUSSEIN TARGET GAME — Only \$15.00

Shoot Patriot Missiles at Actual Pictures of him as he yells at you! TRUE SOUND — As seen on TV News —

CGA & VGA included. Shipped FREE to Desert Storm Military!

CIRCLE 785 ON READER SERVICE CARD

FINANCIAL

The RETIREMENT PLANNER

Forecast your financial future. Build What If scenarios with different Retirement Ages, Investments and Yields, Life Expectancies, and Inflation Rates. Includes latest Tax tables and State tables. Only \$79.95. Order now for FREE "Retirement Planning" book. Demo \$8.50. 30 day money back guarantee.

SoliMark, Inc.

P.O. Box 7025

Beaverton, OR 97007

1-800-541-3212

To place your ad in

**PC MAGAZINE
Classified**

**Call (212) 503-5115
or (800) 825-4ADS**

FOREIGN LANGUAGES

Diplomat Software, Inc.
Alphabets Of The World For Your PC

Series of 36 alphabets providing both English and foreign characters for screen, keyboard and printer support while using existing software. WordPerfect, Word, WordStar, Quattro Pro, Ventura Publisher, Works, dBase — more.

Starter Package \$129
Ventura Support \$35
PageMaker Support \$35
PerfectWord Support \$35
Laser!win \$75

Laser!win is sold only with our Starter Package or Support Package. Starter Package and Support Package are sold for \$35.95 per package. VISA, MC, check, C.O.D. (US only) add \$5. CA residents add 6.75% tax.

Diplomat Software, Inc.
3700 Campus Drive, Suite 202, Newport Beach, CA 92660
Phone (714) 474-8968, Fax (714) 250-8117

CIRCLE 786 ON READER SERVICE CARD

CIAO!

IBM TUTORIALS FOR LEARNING LANGUAGES!

- VOCABULARY TUTOR •
- PRONUNCIATION TUTOR •
- TENSE TUTOR •

• SPANISH • FRENCH • ITALIAN • GERMAN •

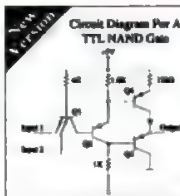
MOST PRODUCTS FEATURE EXTENSIVE DIGITIZED SOUND!

CALL TOLL-FREE TODAY FOR OUR FREE CATALOG!
1-800-726-5087

THE HYPERLINK SOFTWARE COMPANY
505 Forest Hills Blvd., Knoxville, TN 37919

CIRCLE 787 ON READER SERVICE CARD

GRAPHICS



CoDraw

Technical Drawing Software

Quality results. Just \$159.

John Dvorak says:

"Genuinely Interesting Software"

CoHort Software (415) 524-9878
P.O. Box 1149, Berkeley, CA 94701
(This ad was created with CoDraw.)

CIRCLE 788 ON READER SERVICE CARD

New features: import and edit Lotus .PIC and HPGL plotter files, keystroke macros, more and better fonts, EMS memory and RAM disk support, new screen/printers/graphics file drivers, portrait and landscape printing, new Bézier line and fill objects, and much more.

MAILING PROGRAMS

UPS SHIPPING SOFTWARE

Can capture shipping information directly from your invoicing screen or transfer via batch file. Computes Zone, Rate and Charges. Prints UPS Manifest, COD Tags, Shipping Labels, etc. Flexible and very easy to use. Only \$149. Multi-User \$295.

V-TECHNOLOGIES

P.O. Box 4321

WATERBURY, CT 06704

(203) 879-6960

MUSIC

SONGWRITING V MUSIC PROCESSOR

Prints professional sheet music, songs, scores with text, chords, dynamics. Compose, edit, record, play, transpose, copy, extract, import, publish — all in standard notation. Symbol editor/librarian. PC, MIDI or SMF entry & playback. Matrix/laser printers. \$99.95 + \$5 s/h. Free sample output.

SONGWRITING SOFTWARE

7 Loudoun Street, S.E., Suite 5A

Leesburg, VA 22075

(703) 777-7232

Today's PC Mail System

Fast! Accurate! Large volume mailers use PostWare software programs to: standardize & correct addresses, add ZIP, ZIP + 4, Car Rt., presort 1/2/3 Class, detect duplicates, print Postnet bar codes, palletize 2/3 Class, and qualify for postal discounts. CASS certified. Reported throughputs over 100,000/hr.

Postalsolt, Inc.

4439 Mormon Coulee Rd.

La Crosse, WI 54601-8231

608/788-8700 (WI) or 800/831-6245

The Mail Order Wizard

Is one very powerful program. It offers a catalog business all the computing routines it needs — and then some! gives new meaning to the hackneyed phrase, "user friendly." Written in Assembler, it operates with lightning speed. . . very serious software, a must see "Catalog Age."

Age. \$1,670. Demo, \$20.

The Haven Corporation

802 Madison Dept. M

Evanston, IL 60202

(708) 869-3434 or (800) 782-8278

Personal Composer 3.3

"The most elaborate and powerful professional music software available" — *Musician Magazine*

Every composing, MIDI, and music desktop publishing tool in one package.

\$395.00

introductory offer

Call 1-800-446-8088 for info

CIRCLE 789 ON READER SERVICE CARD

MUSIC

Recording Studio in a PC? Piece of Cake.

Cakewalk, the 256-track MIDI sequencer, lets you record, edit, and play back music using a MIDI-compatible instrument. Designed for both musicians and PC hobbyists alike. It's a PC Magazine Editor's Choice! The #1-selling MIDI sequencer for the IBM PC. Only \$150.



Get a Piece.

Call 800-234-1171 and ask for our free catalog.

Full line of MIDI software and hardware available.



Cakewalk 4.0

CIRCLE 790 ON READER SERVICE CARD

Did you know...

On average, PCMagazine's direct market purchasers have spent—

- \$30,000 on hardware
- \$5,400 on software
- \$2,100 on accessories
- an average of \$2,855 per order

PC Magazine is exclusively read by over 786,041* business buyers and brand specifiers, including 90,000 computer resellers and consultants.

83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

Get all the facts. Call your Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

Source: Beta Research Study, 1988
*BPA Audit December 1990

PREVENTIVE MAINTENANCE

MAINTENANCE & INSPECTION

An easy-to-use computerized method to organize, operate, and control an effective preventive maintenance system. Applicable to any type of business or industry. Full screen input and displays, plus function key help command. Maintains historical data, creates work orders, and provides numerous reports. For info, write to PENGUIN COMPUTER CONSULTANTS
P.O. Box 20485
San Jose, CA 95160
(408) 997-7703 FAX 408-927-0570

PROGRAMMERS TOOLS

LAHEY FORTRAN

- F77L-EM/32 - write port 4GB, 32-bit 80386, Debugger, Editor, Graphics Virtual memory, Free runtime
- F77L - Industry leader loaded
- LP77 - New release, ANSI 77, Editor, Debugger - only \$99 • See our Display ad

TEL (800) 548-4778 or (702) 831-2500
Lahey Computer Systems
P.O. 6091
Incline Village, NV 89450
FAX (702) 831-8123

PUBLIC DOMAIN/ SHAREWARE

FREE IBM SOFTWARE CATALOG

Detailed Descriptions

1000's of Great Programs
Only \$2.99 per Disk
Carefully Selected
Fully Tested
Includes Exclusive
10 FREE disk offer

THE SOFTWARE LABS

1-800-359-9998

CIRCLE 791 ON READER SERVICE CARD



The Only Major Monthly
Publication about Shareware.

Do yourself and your company
a favor and subscribe to this
gem. Pays for itself in software
discoveries. - John Dvorak,
PC Magazine

Call for a free sample issue:
800-2424-PSL 713-524-6394

Member - ASP

CIRCLE 792 ON READER SERVICE CARD

PUBLIC DOMAIN/ SHAREWARE

SOFTSHOPPE, INC.

ASP Member

- Selected Programs
- Latest Versions
- As Low as \$1.50

FREE CATALOG IBM PD/SHAREWARE

POB 3678, Ann Arbor, MI 48106

Call 800-829-BEST (2378)
or 313-761-7638
Fax 313-761-7639

CIRCLE 793 ON READER SERVICE CARD

REAL ESTATE

PROPERTY MANAGEMENT

Rental-Ease: New state of the art property management software. Extremely fast and easy to use. Everything is included, tenant tracking, repairs and maintenance, income and expense, check writing. No extra modules to buy. The ultimate in property management. \$695 complete. Free brochure. Demo \$10.
STRATEGIC OFFICE SYSTEMS
688 North 500 West #61
Mt Pleasant, UT 84647
800-942 6784 or 801-462 2130

To place your ad in
PC MAGAZINE Classified
Call (212) 503-6115
or (800) 825-4ADS

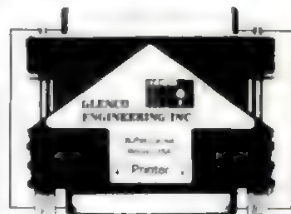
SECURITY

STOP SOFTWARE PIRACY

With our Copy Protection
Products. They really work and
do not burden the honest user...

For Hardware Based Security (Parallel Port Interface)

- STANDARD KEY
Unlimited executions
- COUPON KEY
Limited executions
- READ/WRITE KEY
Field programmable memory
- DURATION KEY TAG
On-chip clock for leases



For Disk Security

High Level Security
With hard disk install/uninstall included

- PADILOCK II DISK
- COUPON DISKS

Low Level Security
User Installable Protection

- PC-PADILOCK

The market is filled with copy
protection products which burden
the user or simply don't work. We
have over 3500 satisfied software
firms utilizing our systems. The
high-level fingerprint has not
required an update in over 3 years.

Call or write for
more information.

GLENCO
ENGINEERING INC.
SERVING THE SOFTWARE INDUSTRY SINCE 1979
800-562-2543

270 Lexington Dr (708) 808 0300
Buffalo Grove, IL 60089 6930 FAX 808 0313
CIRCLE 797 ON READER SERVICE CARD

RELIGION

CHURCH SOFTWARE

Discover for yourself why more churches are choosing **Power Church Plus**.
Try out the leading membership and accounting package.
Call today for your **FREE** full-working DEMO.

F1 SOFTWARE, 6300 Varrel Avenue, Suite H, Woodland Hills, CA 91367
(818) 888-1800

CIRCLE 794 ON READER SERVICE CARD

SECURITY

CopyControl COPY PROTECTION

Control your profits with the copy protection designed
with strength, user-intransparency and compatibility

- Beats ALL the bit-copyers & Dis-assemblers
 - No hardware plugs or special disks required
 - Encrypts your program & adds anti-debug code
 - Allows you to produce full function demos
 - Compatible with LAN, backups & disk utilities
 - Supports all Floppy & Hard disk formats
 - Allows you to change parameters remotely
- Control when, where, and how your software is ran
Compatible with all IBM/DOS Computers.

\$595 Unlimited Version. 30 day Money back guarantee
Also available by Meter Count
Free Demo & Info • COD • PO

Microcosm Inc.

Drawer 0, Wellington, MO 64097

(800) 237-8400 ext. 212

(816) 834-8384 / Fax (816) 834-2617

CIRCLE 795 ON READER SERVICE CARD

SOFTGUARD Copy Protection

Manufacturers depend on
Softguard Copy Protection
Systems to protect their
software. **SuperLock™** and
TrialDisc™ features include:

- IBM PC, compatibles,
and Macintosh
- Invisible to End Users
- Hard Disk Support
- No Source Code
Changes Required
- LAN Support

For more information, or to order, call
415-651-5580/FAX 415-651-7814

Datapath

CIRCLE 796 ON READER SERVICE CARD

SECURITY

continues on the next page.

PC CLASSIFIED

SECURITY



SOFTWARE OR HARDWARE TO PROTECT YOUR \$\$ PROFITS \$\$

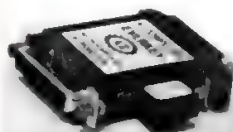
Since 1986, thousands of companies worldwide have chosen Az-Tech Software as partners in their fight against Software Pirates. Why? Because Az-Tech has offered them:

EVERLOCK SOFTWARE COPY PROTECTION
EVERTRAK SOFTWARE SECURITY
EVERKEY HARDWARE PROTECTION

The ALL IN ONE device that offers:

- REMOTE RESETS
- SERIALIZATION
- DATE EXECUTE LIMITS
- COMPRESSION

and much, much more.



These products are easy to use and most important, they work! No one in the market place can offer you the Flexibility, Ease of Operation, or Degree of Protection that You receive with Az-Tech products.

Call Today for a FREE Demo
800-227-0644



Az-Tech Software, Inc.
Security Products That Work

305 East Franklin • Richmond, MO 64085
(816) 776-2700 • FAX (816) 776-8398
CIRCLE 814 ON READER SERVICE CARD

CIRCLE 798 ON READER SERVICE CARD

BIT-LOCK™ SECURITY

Pracy SURVIVAL 8 YEARS proves effectiveness of powerful multilayered security. Rapid decryption algorithm. Device transparent to PARALLEL or SERIAL port. Complimented by low cost KEY-LOCK™ multifunctional COMPU-LOCK™ Countdown, timeout, data encoding, multi-product protection, DOS/UNIX Access control MICROCOMPUTER APPLICATIONS
3167 E. Otero Circle
Littleton, CO 80122
(303) 770-1917

SOFTWARE COPY PROTECTION

- Installs easily on your IBM-PC software
 - Defeats all disk copy software
 - Supports all Hard & Floppy disk formats
 - Requires NO special devices or disks
 - Invisible to your end user
- Eval. disk protects 2 disks \$25
Starter kit protects 100 disks \$99
- L-Tech Corporation
377 Route 17 South, Suite 618
Hasbrouck Heights, NJ 07604
(201) 288-1608 BBS 201-288-8795 (8-N-1)

STATISTICS

Power Designed to Fit Your Needs

MINITAB is the easy-to-use statistical package that lets you master a broad range of functions within one hour.

- Basic Statistics
- Regression
- Control Charts
- Hi-Res Graphics
- Time Series
- ANOVA and ANCOVA

...and more

CALL 800-448-3555

MINITAB
STATISTICAL SOFTWARE

Minitab Inc.

3081 Enterprise Drive • State College, PA 16801

CIRCLE 799 ON READER SERVICE CARD

SURVEYS

THE SURVEY SYSTEM

An easy to use menu driven system for the entry, editing, processing and presentation of questionnaire data. The system can produce camera ready cross-tabs and other tables in banner format. Also statistics and graphics. Regression and open-end coding analysis options available. CREATIVE RESEARCH SYSTEMS
15 Lone Oak Cir., Dept. P
Petaluma, CA 94952
(707) 765-1001

UTILITIES

LIMSIM

Expanded Memory Simulator for 286, 386, 486 & 286 NEAT machines. Use the extended memory you already have as Lotus style Expanded Memory. PC Magazine says "Easy to use and well documented." \$80. 30 day money back guarantee. Visa/MC accepted
Larson Computing
1556 Halford Ave. #142
Santa Clara, CA 95051
(408) 737-0627

Silly Little Icons



For use with Microsoft Windows 3.0
Book 1 - 140 Icons - \$27.95
Book 2 - 180 Icons - \$34.95
Books 1 & 2 - 320 Icons - \$48.95
Specify Book No. & disk size when ordering. Includes S/H in N. America.
Dunn Enterprises
4 Prospect Terrace • Gorham, NH 03581
(603) 466-5234

Windows is a trademark of Microsoft Corporation

CIRCLE 800 ON READER SERVICE CARD

WORD PROCESSING

The International Standard for Word Processing

The Universal Word® can support every human language, from Arabic to Zulu - over 75 languages. More Advanced Features, Better Performance, & Greater Ease of Learning and Use. Special Introductory Offer.

Free typefaces & definition dictionary, unlimited telephone support; 30 day money back guarantee. English Ver. \$395 \$237.00 Multilingual Ver. \$495 \$346.50 Right-to-left lang. (e.g. Arabic) \$495 \$346.50
5959 W. Century Blvd. Postbox Floor L.A. CA. USA 90045
800-776-7674 (213) 215-9645 Fax: (213) 215-9668 WYSIWYG®

MISCELLANEOUS/ACCESSORIES

COMPUCOVER® COVER YOUR INVESTMENT



Computer Dust Covers

Spill Proof!! Anti-Static!! Our Stylish fitted Dust Covers will look good on your computer and give maximum protection from dust and spills. Avoid expensive repair and downtime. Over 4,000 designs available in Nylon or Clear Plastic. Check our Prices!!

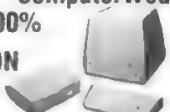
Dealer Inquiries Invited

USA (800) 874-6391 Fax (904) 863-2200
FLA (800) 342-9008 (904) 862-4448

2104 Lewis Turner Blvd. (Dapt PCM)
Fort Walton Beach, FL 32548 MC
Visa

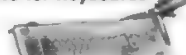
CIRCLE 801 ON READER SERVICE CARD

DUST COVERS 100% COTTON CANVAS



Breathable! Static-Free! Beige with Gray Trim. For Computers, Keyboards, Printers & Lasers. All Popular Models. Superior Quality. Best Price.

NEW! ViziFlex-Seals SKINS for Keyboards



1-(800) 826-5761

Contemporary ComputerWear
1320 36th Ave San Francisco CA 94122

CIRCLE 803 ON READER SERVICE CARD

BAR CODING

BAR CODE READERS AMERICAN MICROSYSTEMS

2190A Regal Pkwy. • Euless, Texas 76040 • (817) 571-9015

FOR PC, XT, AT, PS/2 & TERMINALS:

- No software changes required
- Data appears as keyboard input
- Reads Code 39, I-2of5, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey
- Auto-discriminates between codes
- Accepts WAND, SLOT, CCD, LASER, MAG STRIPE



BAR CODE PRINTING SOFTWARE:

- For Epson OKI, IBM Dot Matrix and HP LaserJet Printers.
- Prints Code 39, I-2of5, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey
- Easy to use

(800) 648-4452 • FAX: (817) 685-8232
30 Day Money Back Guarantee
One Year Warranty

BAR CODE & MAGNETIC STRIPE READERS For PC/XT/AT, PS/2, and RS-232 Interface

- Direct keyboard interface, no software change
- Reads UPC, EAN Code 39, 11, 128, 125, Codabar, MSI
- Direct from manufacturer, 30 day money back guarantee
- Reader with steel wand - \$379
- with Magnetic Stripe Scanner - \$299

SCANTECH 12981 Ramona Blvd. Unit 1
Irvine, CA 92718 3797

TEK. 918.962.4819

CIRCLE 802 ON READER SERVICE CARD

Calling about an ad? Say you saw it in **PC Magazine Classified**

BAR CODING

BAR CODE HEADQUARTERS

LABELING SOFTWARE

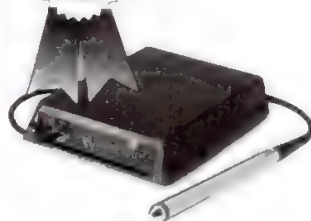


- For Epson, Oki, IBM, Dot Matrix and HP LaserJet Printers.
 - Any Format. Any size. Totally flexible design. Many formats furnished.
 - One Screen Label Design, WYSIWYG or text. Context sensitive help.
 - 16 text sizes — from .1" to 3" (reads at 100').
 - 13 Bar codes: 2of5, 128, UPC/EAN, MIL-STD, AIAG, ZIP, & Code 39.
 - Auto-incrementing. Simple operator interface. File input.
 - Reversals, color, soft fonts. Prints PCX files for logos, symbols, etc.
 - Powerful, Versatile, Easy, Fast! (drives LaserJet at 8ppm).
 - Scalable fonts any size to 13" on LaserJet III.
 - Label shown printed with LabelRIGHT™ — \$279
- (Other DOS bar code programs from \$129. SCO/UNIX — \$199).

PORTABLE READERS

- Battery operated reader. Wand or laser input.
- Simple, powerful, 64K memory. Built in real-time clock.
- Bar code or keyed input. Easy raised rubber keyboard.
- Reads Codabar, MSI, 2of5, UPC/EAN, 128, Code 39.
- Easily programmable prompts. Uploads via RS-232 or keyboard.
- Doubles as non-portable reader (on-line wedge operation).
- Complete with stainless steel wand — \$849

FLEXIBLE MAGAZINE
"Outstanding
Price And
Function"



BAR CODE READERS

- For PC, XT, AT, PS/2, Mac and all RS-232 Terminals
- Attaches as 2nd keyboard. No software changes needed.
- Reads 2of5, Codabar, UPC/EAN, 128, MSI, Code 39.
- 1 or 2 input scanners: wand, slot badge, magstripe, or laser.
- Top rated by independent review!
- Complete with steel wand — \$399.

Direct from manufacturer
30 day \$ back guarantee!
Company P.O.'s accepted
2 year warranty on wand & reader



WORTHINGTON

DATA SOLUTIONS
417 Ingalls Street • Santa Cruz, CA 95060

FAX 408-458-9964
408-458-9938

800-345-4220

PC WAND BAR CODE READERS MORE FEATURES MORE AFFORDABLE



NEW
IMPROVED

Starting at \$279 with wand! • Transparent operation. • No software required • PC, XT, AT, Mac, PS/2, others. Look into our full line of reliable, competitively priced readers, keyboard and serial wedges, portable data collectors, multi-drop readers, wands, laser scanners, mag stripe readers, and bar code printing software • OEM and reseller discounts. We provide solutions to systems! Custom application software for Data Collections available. Call for details.

**INTERNATIONAL
TECHNOLOGIES
& SYSTEMS CORP.**

655-K North Berry St., Brea, CA 92621
(714) 990-1880 • FAX (714) 990-2503
13 Welwyn Ct., Richmond, VA 23229
(804) 741-6725

CIRCLE 804 ON READER SERVICE CARD

BAR CODE READERS

Keyboard Wedges for
IBM PC/XT/AT, PS/2 models,
All Macintosh models,
IBM, DEC, MEMOREX/TELEX,
and Wang terminals.

Direct from manufacturer
Reseller inquiries welcome

BARKON ELECTRO-OPTICS, INC.
703-876-9055

Did you know...

On average, PC Magazine's direct market purchasers have spent—

- \$30,000 on hardware
- \$5,400 on software
- \$2,100 on accessories
- an average of \$2,855 per order

PC Magazine is exclusively read by over 786,041* business buyers and brand specifiers, including 90,000 computer resellers and consultants.

83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

Get all the facts.
Call your Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

Source: Beta Research Study, 1988
*BPA Audit December, 1990

BAR CODING

YOU WILL SAVE TIME AND ELIMINATE ERRORS WITH YOUR APPLE®, DEC™, IBM®, OR WYSE® COMPUTER AND PERCON® BAR CODE READERS.



You've never entered data so quickly or so accurately as you will using bar codes or magnetic stripes, and a PERCON Series 10 decoder. Our proven, reliable decoders "Auto-Learn" up to 13 key bar codes, require no software changes, and leave your keyboard free to use at all times. Simple keyboard, bus, or serial port plug-ins for a range of computers and terminals. 5 year warranty on decoders, 1 year warranty on input devices.

Call 1-800-8-PERCON.

PERCON
INCORPORATED

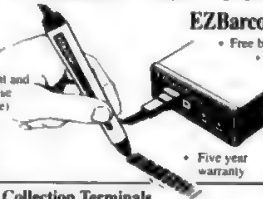
1710 Willow Creek Circle, Eugene, OR 97402 (503) 344-1189 FAX (503) 344-1399
AppleLink: D3857 CONNECT: PERCONENG 1

PERCON, Apple, DEC, IBM, and Wyse are trademarks of their respective companies.

CIRCLE 806 ON READER SERVICE CARD

TKS Builds a Better Bar Code Reader!

- Excellent first read rate
- Works with any program — no software required
- Plastic wand is rugged, lightweight and comfortable, even after hours of use (stainless steel wand also available)
- Durable extruded aluminum case
- Reads all major bar code types
- 30-day money-back guarantee



EZBarcode PC-WEDGE II

- Free bar code printing utility included
- Complete with wand, it's

only \$289!

RS-232 version \$319
Macintosh version \$399
Stainless steel wand add \$60
Mag stripe option add \$180

• Five year warranty

Portable Hand held Data Collection Terminals

- Easy-to-use application generated software included free
- PHT-34: Alphanumeric keypad, bar code wand, 128K memory .. \$1095
- PHT-60: Graphics touch-sensor LCD display, programmable function keys, bar code wand, RAM card port, 256K memory .. \$1795

Bar Code Printing Programs ... \$149 each

- Print Code 39, UPC, EAN, 2 of 5 on dot matrix or Laser Jet printers
- EZBarcode II - Keyboard or text file input, incrementing, on-line help
- dBARCODE - Prints bar codes from within dBASE
- EZRes - Memory resident bar code printing program

TimeKeeping Systems, Inc.

1306-C East 55th Street • Cleveland, Ohio 44103 • Phone: (216) 361-9995 • Fax: (216) 361-0030

Did you know...

83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

BOOKS/CATALOGUES/PUBLICATIONS

IBM PCjr & CONVERTIBLE

SPECIALS

PCjr
128K External Memory
256K Internal Memory
512K Internal Memory
Second Floppy Drives
5-1/4" 3.5"
20 Meg Hard Drive
Parallel Attachment
Serial Cable Adapter
Mouse & Dr. Halo 3
Keyboard Cord
Internal Modem
101 Key Keyboard
JOYSTICK
Cluster Network
Adapter

CONVERTIBLE
New Convertible with
256K Backlit LCD
128K Memory Card
256K Memory Card
384K Memory Card
Serial/Par Attachment
CRT Adapter
Enhanced LCD
20 Meg Hard Drive
Portable Printer
Printer Cable
Std. 1200bpd Modem
Enh. 1200bpd Modem
New Battery
IBM Carrying Case

PCjr & PC SOFTWARE

Many GOOD Titles FREE Catalog

CALL, WRITE, or FAX to get our FREE CATALOG

TERMS: Prepaid or COD - Qualified Schools and Government PO's Accepted

COMPUTER
RESET
(214) 276-8072
Dep. FCC
P.O. Box 461762
Garland, Texas 75046-1782
BBS & FAX (214) 272-7920

Computer Deal & Shop

CIRCLE 806 ON READER SERVICE CARD

PCjr Owners!!

Everything You'll Ever Need Plus Much, Much More!

- Memory Sidecars - Expand now to 1.2 MB!
- Second & Third Disk Drives which Snap-On-Top
- 3 1/4" 720K Disk Drives for PS/2 Compatibility
- Speed-Up Boards-Increase Speed to 9.54 MHz
- 20, 30, 40, 60 & 80MB Hard Disk Drive Systems
- 101-Key Enhanced PCjr Keyboards
- Serial Port Compatibility Boards
- Modifications for Tandy Compatibility
- PCjr Compatible Software & Game Cartridges
- PCjr System Units with 128K or 256K
- Diagnostic Service Only \$25
- Replacement Parts and Repair Service

Remember—When you purchase all your PCjr products from PC Enterprises you'll never need to worry about compatibility. Our new full color catalog now features over 300 PCjr products on 54 pages. Call or write for your FREE copy today!

(800) 922-PCjr (201) 280-0025

PC ENTERPRISES

"The jr Products Group"

PO Box 292 Belmar, NJ 07719

"Dedicated to the Support of the PCjr Since 1984"

CIRCLE 809 ON READER SERVICE CARD

DATA CONVERSION

CONVERTING YOUR DISKETTES?

ENTRUST THEM TO US

2500 Word Processor & Computer formats 3 1/2", 5 1/4", 8" DISKS, MAGNETIC TAPES, MAGNETIC CARDS, CARTRIDGES, & CASSETTES

DISK DUPLICATION OCR SCANNING SERVICES

Customized conversions too!
Call us for quality, best prices and quickest turnaround time.

COMPANY COMPENDIA, INC.

TEL: 312-419-8771 (Chicago)

FAX: 312-419-1390

CIRCLE 807 ON READER SERVICE CARD

DATA CONVERSION

TOTAL SERVICE CONVERSIONS

- OUR NAME SAYS IT ALL •
- Quality Service •
- Quick Turnaround •
- Low Prices •
- 1-800-5-CONVRT (526-6878) •
- In CA 1-213-669-8134 •
- Word Perfect Training Available •
- TOTAL SERVICE CONVERSIONS, INC.
- 1933 North Monon Street
- Los Angeles, CA 90027

DISK/TAPE/OPTICAL SCANNING

- 33¢ per page typewritten text to disk in ASCII, 50¢ per page all WP formats
- Scan Typeset text 6 to 24pt low rates
- Disk convert from IBM, WANG, XEROX, VYDEC + 1000 others customized
- Tape conversions (800, 1600, 3200, 6250 BPI)
- BEST RATES • FREE TEST
- 1st RUN COMPUTER SERVICES
- 1261 Broadway Suite 508
- New York, NY 10001
- (212) 779-0800 (800) 833-2207

DATA RECOVERY SERVICES

ONTRACK DATA RECOVERY

The Data Recovery Professionals

Ontrack Data Recovery specializes in recapturing data from any microcomputer hard drive or floppy diskette.

- 95% Success Rate • Fast Turn Around
- Expertise with Novell, DOS, Macintosh, OS/2, Unix, Xenix, Bernoulli, Sun and more!

Find out why we are the leaders in data recovery - call an Ontrack Data Recovery representative today for more information.

1-800-872-2599

MN: 612-937-5161 FAX: 612-937-5750

CIRCLE 808 ON READER SERVICE CARD

DISK CONVERSION

TAPE-TO-FLOPPY
FLOPPY-TO-TAPE
TAPE DUPLICATION
FLOPPY-TO-MICROFICHE
LASER PRINTING

1-800-422-9622
(In OK: 918 254 9622)



**TECHNICAL PROGRAMMING
SERVICES, INC.**
8506 EAST 61ST STREET
TULSA, OK 74133 1301

CIRCLE 810 ON READER SERVICE CARD

TAPE/DISK CONVERSIONS



Conversion services to or from
over 2000 computer systems:
• Magtapes • Mini Computers
• Micro Computers • Typesetters
• Word Processors

CALL THE INDUSTRY LEADERS

**PIVAR
COMPUTING SERVICES, Inc.**

800 - CONVERT
708-459-6010

165 Arlington Heights Rd #M
Buffalo Grove, IL 60089

DISKETTE COPY SERVICES

SOFTWARE DUPLICATION

- One-Stop Shopping
- Diskettes & Tapes
- Document Printing
- Custom Printing
- Custom Packaging
- Fulfillment
- Fast Turnaround



MEGAsoft

P.O. Box 710, Freehold, NJ 07728

800-222-0490

In NJ 908-462-7628
FAX 908-462-5658

CIRCLE 814 ON READER SERVICE CARD

DUPLICATION FROM \$.59 HIGHEST QUALITY MEDIA

MSDOS duplication from \$.59 (5 25")
and \$.99 (3 5"). Prices go even lower
as you continue to order!

- Duplication + 100% Verification
- Custom Labels/Sleeves/Mailers
- Custom Packaging & Assembly
- Colored Media Available
- Special Rates For Demo Software & Site Licensing
- Educational Discounts Available
- 24 Hour Turn-Around
- Guaranteed Products

800-255-3142

Diversified Systems Group, Inc.
PO Box 1114, Issaquah WA 98027

CIRCLE 818 ON READER SERVICE CARD

DISKETTE COPY SERVICES



CORPORATE DISK COMPANY™
CD TECHNOLOGIES INC. • CD MARKETING INC.



TAPE AND DISKETTE DUPLICATION

**"THE ONE STOP SHOP FOR
SOFTWARE DEVELOPERS"**

STOP going to 5 different
suppliers! It can all be done
with one easy phone call.

Our Services Include

- Diskette Silk Screening Process
- Printed Sleeves & Labels
- Duplication Equipment
- Printed Binders & Slipcases
- Low Cost Diskettes
- Printed Documentation Pages

"You have to make but one phone call to the Corporate
Disk Company and can consider the job done"

**In Illinois (708) 439-DISK
Nationwide 1 (800) 634-DISK**

© 1989 by CD Marketing Inc.

CIRCLE 811 ON READER SERVICE CARD

SOFTWARE

Quality Duplication at Affordable
Pricing • Custom Labeling &
Packaging • Fast Turnaround

Disk & Dupe	500	1000	5000
3.25" DS/DD	.55	.50	.47
5.25" DS/DD	.98	.92	.86
3.5" OS/DD	.82	.79	.75
3.5" OS/HD	1.92	1.70	1.65

Prices include Sleeves

DUPLICATION

**(800) 426-0247
PRINCETON
DISKETTE**

1800 Richmond Ave. • P.O. Pleasant Bch., NJ 08742

CIRCLE 812 ON READER SERVICE CARD

*Software
Production*

- Disk Duplication
- EVERLOCK copy protection
- Label/sleeve printing
- All formats • Warehousing
- Full packaging services
- Fulfillment • Drop shipping
- 48-hour delivery
- Consultation & guidance

Star-Byte, Inc.

2880 Bergey Rd Hatfield PA 19440

800-243-1515

CIRCLE 813 ON READER SERVICE CARD

INSURANCE



SAFWARE

**INSURES YOUR
COMPUTERS**

Full replacement of hardware, media,
purchased software. As low as
\$49 yearly. Covers fire, theft, power
surges, other accidents. Blanket
coverage; no list of equipment
needed. Call for information or
immediate coverage

1-800-848-3469
Local (614) 262-0559

SAFWARE, The Insurance Agency Inc
2929 N. High Street, P.O. Box 02211
Columbus, OH 43202

CIRCLE 819 ON READER SERVICE CARD

SUPPLIES

TONER CARTRIDGES

TESTED • GUARANTEED • 24-HR. TURN.

HP DeskJet Refills! **RECONDITIONED** HP, Apple, Canon, QMS, etc.

Save Money • Colors

Water - Proof Ink

• MICR Toner Available •
Atlanta, GA Office Also!

Canon Microfiche & Copiers

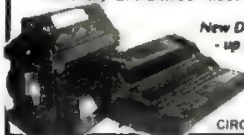
Fujitsu RX-7100: \$70

IBM 4019 Toner Cartr: \$80

\$45

NEW! NEW TONER CARTRIDGE SPECIAL!
Canon Brand Series (B) toners, min.
of four, C.O.D., VISA/MC/AMEX only

\$79.95



New Drum for Series II & III,
- up to 10 Records - ask!

Ship extra C.O.D. \$3.75;
Credit Card Surcharge

1-800-239-4027

1-800-722-2804 (GA)

ADVANTAGE LASER PRODUCTS
2216 University Blvd
Tuscaloosa, AL 35401

CIRCLE 815 ON READER SERVICE CARD

TONER

LASER

7615 Washington Ave. N.
Edina, Minnesota 55435

OPC kits, toner, &
supplies for HP, NEC,
Ricoh, Qume, Hitachi,
Fujitsu, Dataproducts,
& many more.
• Franchises Available

We will rebuild your
cartridge or one from
our stock.
Services from:

\$41.50

800-777-8444

CIRCLE 816 ON READER SERVICE CARD

24 HOUR TURNAROUND

QUALITY TONER CARTRIDGE REMANUFACTURING

- 20% More Toner
- Darker Print
- 100% Guaranteed
- Replacement drums now available
- We Buy Empties

Laser Research, Inc.

9741 M-Southern Pine Blvd

Chandler, N.C. 28273

1-800-462-7143

\$39.95

SHIPPING INCLUDED

CIRCLE 817 ON READER SERVICE CARD

Calling about an ad? Say you saw it in
PC Magazine Classified

PC Magazine's BusinessCard section is a forum for innovative, hard-to-find and low-cost PC products and services. Ads are listed by product category and include Reader Service numbers to allow fast, easy response.

RATES:

1 issue—\$600, 3 issues—\$550, 6 issues—\$510,
12 issues—\$480, 17 issues—\$460, 22 issues—\$450.
Multiple-ad per issue rates also available.
Prepayment must accompany each insertion.
VISA/MC welcomed.

AD FORMAT:

PC Magazine will design and typeset each BusinessCard ad. Advertisers should furnish type-written copy. Ads include: 1) Headline (one line, initial caps=30 characters maximum, all caps=25 characters maximum), 2) Descriptive copy (5 lines, 225 characters maximum), 3) Company name (same specifications as headline), and 4) Address and telephone number (two lines, 40 characters per line). Sorry, no logos, artwork or camera-ready ads.

DEADLINES:

PC Magazine is published 22 times a year, (bimonthly except for July and August). The BusinessCard closing is approximately two months prior to issue date.
Please send copy and payment to: PC Magazine BusinessCard, One Park Avenue, 3rd Floor, New York, NY 10016, ATT'N: Vickie Pinsky.
For more information, call Vickie Pinsky at 800-825-4237 or 212-503-5120, FAX: 212-503-5860.

HARDWARE/CD-ROM

CD-ROM SALES & MANUFACTURING

CD-ROM • WORM • Magneto-Optical
IBM & MAC CD-ROM Discs
Custom Hardware Manufacturing
International Worldwide Sales • Dealer Programs
Complete IBM & Mac Products Catalog Available

CD ROM, INC.

1667 Cole Blvd • Ste. 400 • Golden, CO 80401
Tel: 303-231-9373 • Fax: 303-231-9581

CIRCLE 1 ON READER SERVICE CARD

EXPANSION UNITS

AWARD BIOS ROMS

Upgrade your IBM XT, AT, or XT/286/386
Compatible. Add support for 3.5" 1.44Mb
Floppies, 101/102 Keyboard F11 & F12 keys,
ESDI and IDE Hard Drives.—Authorized Award
Distributor.

KOMPUTERWERK

851 Parkview Blvd. Pittsburgh, PA 15215
800 423-3400 • (412) 782-0384

CIRCLE 2 ON READER SERVICE CARD

RENTALS

PC COMPUTER RENTAL

The #1 national discount computer rental company
in the U.S. Offices in all major cities.
Featuring IBM, Apple and Compaq—plus a complete
host of peripherals. Call us for a solution to
your short term computing needs.

PC COMPUTER RENTAL CORP.

National Sales Division
1-800-785-4727

CIRCLE 3 ON READER SERVICE CARD

We Make It So Easy—

Leave your business card with us and we'll do the
rest. PC Magazine will create your BusinessCard
for you. It's so easy—and so very effective.

BusinessCard

Call 1-800-825-4237 today.

SOFTWARE/BUSINESS

ORDERS MGMT SOFTWARE

MICRO-POINT. For distributors, brokers and jobbers.
*SALES & PURCHASE ORDERS*ACKNOWLEDGEMENTS*INVOICES*STATEMENTS*
CHECKS*SHIP LABELS*COMMISSIONS*SALES
TAXES*GENERAL LEDGER*ACTIVITY TRACKING**

Micro Assistance, Inc.

509-255-9220 FAX 509-255-9455
P.O. Box 157 Liberty Lake, WA 99019-0157

CIRCLE 5 ON READER SERVICE CARD

BUSINESS TIME MANAGEMENT

Staff Scheduling Simplified!

WHO WORKS WHEN® automates the tedious task
of employee scheduling. Features: 24-hr scheduling,
multiple shifts/stations, rotations, skill levels,
employee preferences; Job Code/Station/
Team parameters. Prints 11 reports. \$895.

Newport Systems

P.O. Box 3705 Bellevue, WA 98009-3705
(800)782-1233 • Fax:206-455-4895

CIRCLE 6 ON READER SERVICE CARD

CONSTRUCTION

Construction Accounting

CMAS is integrated & designed for contractors
who track job costs. Modules include job cost, pr.
s/r, s/p, g/l, p/o, inv, service billing, dispatch,
est, aia billing, report generator. Runs on Dos,
Xenix, Novell, AIX.

DATA BASICS

11000 Cedar Rd., Cleveland, OH 44106
216-721-3400

CIRCLE 7 ON READER SERVICE CARD

DATA BASE

dBASE file access from C/C++

Build a multi-user, 85k, dBASE compatible appli-
cation using pull-down menus, popup windows,
and data entry. Then port your application to
UNIX, Microsoft Windows or OS/2 without chang-
ing any code. \$295 with source. FREE DEMO.

Sequit Software Inc.

Box 5659, Stn. L, Edmonton, Ab. Can. T6E5V1
Call (403) 448-0313 Fax (403) 448-0315

CIRCLE 8 ON READER SERVICE CARD

EDUCATION

AUTHORING SYSTEM

Develop educational programs, limited only by
your imagination. Include animation, graphics,
sound, variable tracking, multiple branching, and
more. Create stand-alone EXE's. Easy to use. No
royalties. For IBM/Compatibles.

RIDGEWOOD SOFTWARE

P.O. Box 409, Glenview, IL 60025
(800) 243-4724

CIRCLE 9 ON READER SERVICE CARD

MARKETING POWER

Is yours when you place your message in this
space. Reach 786,000+ buyers of all kinds of PC
products. Give your business card PC Magazine
Marketplace Power.

BusinessCard

Call 1-800-825-4237 today.

FLOW CHART

Windows flowcharter \$129

RFFlow 2.0 is a professional drawing tool for
flowcharts and org charts. Requires Microsoft
Windows 3.0. 100 shapes auto adjust in size.
Diagonal lines and curves. Auto line routing and
re-routing. Call for free trial disk.

RFF Electronics

1053 Banyan Court, Loveland, CO 80538
Phone: 303-663-5767 Fax: 303-669-4889

CIRCLE 11 ON READER SERVICE CARD

Hand Your Business Card...

To 786,000+ of the most qualified buyers in the
PC market. These brand-specifiers are looking to
buy while reading the industry's #1 publication.
There is no more cost-effective or efficient way for
you to build sales.

BusinessCard

Call 1-800-825-4237 today.

GRAPHICS

RAINDROP™

FAST, compact PrtScr Utility for end users
AND developers. Hardcopy as fast as 10 secs.
Avg. binary size ~ 6kb. 14 video graphic stan-
dards. 'Call' from user-written programs. Complete
dot-matrix, Inkjet, and laserjet library \$44.95.

ECLECTIC SYSTEMS

8106 St. David Ct., Springfield, VA 22153
(703)440-0064 • FAX (703)455-8965

CIRCLE 13 ON READER SERVICE CARD

FRactal GRaFICS

Design breathtaking images and scientific models
interactively with your mouse. On-line tutorial, 150
page Guidebook, and 200+ dazzling examples
help you use and understand fractals and Chaos.
PCX compatible. Only \$79. FREE brochure.

Cedar Software

1st Route, Box 5140, Morrisville, VT 05661
(802) 888-5275

CIRCLE 14 ON READER SERVICE CARD

PEN PLOTTER EMULATOR

FPlot turns your printer into an HP pen plotter.
Fast h-lines, no jagged lines. Vary line width, color.
Screen preview - zoom, pan. Works with CAD,
graphics programs. Supports most printers. NEW
v3. \$119+\$3 S&H. VISA/MC/Chk/MO.

FPlot Corporation

24-16 Steinyard St., Suite 605
Astoria, NY 11103 • 718-545-3505

CIRCLE 15 ON READER SERVICE CARD

GRAPHICS

35mm SLIDES • OVERHEADS

Vibrant, high-quality output from your PC software. Dozens of software packages supported. Transmit your files anytime. Free reshoots.
For free user kit call toll-free 1-800-433-8829

IMAGE CENTER

1011 Second St., S.W. • Roanoke, VA 24016
703-343-8243 • Fax 703-343-0891

CIRCLE 16 ON READER SERVICE CARD

MAILING PROGRAMS

Keep Track of Your Mail

The Mail System keeps track of all incoming and outgoing mail, bills, faxes. It keeps track of deadlines. It prints reports in many ways. Price \$125. Shipping \$3. Fl. res. add sales tax.
Check/Visa/MC. Fax (407)367-0408.

Decos Software Eng. Inc.

115 E. Boca Raton Rd., Suite 4
Boca Raton, FL 33432 • (407)367-0407

CIRCLE 22 ON READER SERVICE CARD

REAL ESTATE

Property Management

Software for managing residential, commercial, condos, etc. Basic version for owner/manager-\$495, Deluxe for professional managers-\$1,195, Network-\$2,395. Includes check writing, recurring expenses, G/L, management reporting.

YARDI SYSTEMS, INC.

819 Reddick Street, Santa Barbara, CA 93103
(805) 966-3666

CIRCLE 28 ON READER SERVICE CARD

MEDICAL

PRACTICE BILLING

MD VersaForm, flexible, ledger based design, billing package. Programmable; customizable reports, files, and screens; includes database mgmt system and full source. LAN support. \$995. single user. Free literature and demo.

Applied Software Technology

591 W. Hamilton Ave., Ste. 201, Dept. 99
Campbell, CA 95008 (800)678-1111 Ext.99

CIRCLE 23 ON READER SERVICE CARD

We Make It So Easy—

Leave your business card with us and we'll do the rest. We will create your BusinessCard for you. It's so easy—and so very effective.

BusinessCard

Call 1-800-825-4237 today.

PREVENTIVE MAINTENANCE

FLEET/EQUIP MAINTENANCE

A preventative maintenance & report system for vehicles/equip that need periodic service. Some features: Scheduled service reports, Service history, Full operating cost reports, User defined codes, Cost per mile/hour reports.

Ram Systems, Inc.

224 Causeway Blvd., La Crosse, WI 54603
(608) 782-8130 FAX: (608)784-5115

CIRCLE 24 ON READER SERVICE CARD

RELIGION

Bible Study Software

For 10 years we have remained the leading Bible study software company. Think of us as a Bible bookstore with an integrated family of software products for your Bible study needs! Call for a FREE catalog!

Bible Research Systems

2013 Wells Branch Pkwy. #304 Austin, TX 78728
1-800-423-1228 1-512-251-7541

CIRCLE 30 ON READER SERVICE CARD

INVENTORY

INVENTORY MANAGEMENT

Stock-Master 4.0, com. grade system, has Stock Status Rptg, PO Write & Track, Trend Analysis, QC Rptg, Trans Hist Detail Analysis, Multi Loc support, BOM, Matl Req Planning, Serial/Lot No Track, Quote/Ord/Inv Prep.

Applied Micro Business Systems, Inc.

177F Riverside Ave, Newport Beach, CA 92663
714-759-0582

CIRCLE 15 ON READER SERVICE CARD

PROGRAMMERS TOOLS

BASIC PROGRAMMING TOOLS

Crescent Software offers many tools for QuickBASIC and PDS, all with tutorials and full source. Assembly routines, graphics, screen design w/data entry, BASIC TSR's, and much more. No royalties. Call or write for our catalog.

Crescent Software

32 Seventy Acres, W. Redding, CT 06896
Orders: 800-35-BASIC, Tech: 203-438-5300

CIRCLE 25 ON READER SERVICE CARD

CHURCH SOFTWARE

The HELPER I, a leading church management package since 1984. Tracks membership, pledges, contributions, and attendance. Includes fund accounting general ledger. Complete packages from \$595. Call or write for free demo.

TECHNOLOGY CONCEPTS, INC.

2104 Edgewood Dr • W Lafayette, IN 47906
(800) 477-5824 • (317) 583-3211

CIRCLE 31 ON READER SERVICE CARD

SCIENTIFIC

Scientific SW - free catalog

A great selection of scientific software products for plotting, non-linear curve fitting, chemical equilibrium calculations, simulation, statistics, symbolic algebra, and more. Prices range from \$150-\$1000. Call: 1-800-942-MATH

MicroMath

Salt Lake City, UT 84121-0550

CIRCLE 32 ON READER SERVICE CARD

dfELLER Inventory

Business inventory programs written in modifiable dBASE source code. dfELLER Inventory \$150, dfELLER PLUS \$200 with History and Purchase Orders (Good for Stockrooms) Requires dBASE III PLUS, or dBASE IV.

Fellor Associates

550 CR PPA, Route 3 Ishpeming, MI 49849
906-486-6024

CIRCLE 20 ON READER SERVICE CARD

BASIC PROGRAMMERS

Call us for an excellent assortment of add-on products for QB and BASIC PDS. We specialize in assembler routines that make your programs faster & smaller, as well as a wide assortment of productivity tools that save you time. No royalties.

MicroHelp, Inc.

4636 Huntridge Drive Roswell, GA 30075
(800) 922-3383 (404)594-1185

CIRCLE 26 ON READER SERVICE CARD

Shake Hands

With over 786,000+ of the most qualified PC buyers in the market—right here—in PC Magazine Marketplace BusinessCard.

BusinessCard

Call 1-800-825-4237 today.

CLARIFY YOUR FORTRAN

- CLARIFY algorithmic logic into sharp relief
- Visualize FORTRAN program control, flow
- Delineate do loops, block ifs, transfers
- Make code debugging, development easy, quick
- 8 yrs development; enhances maintenance, Q/A

Q-KELTIC SOFTWARE

9 South 450 Parkway Dr.,
Downers Grove, IL 60516 708-985-5190

CIRCLE 27 ON READER SERVICE CARD

Software for Chemists

- PERIODIC PLUS comp. chem. ref. •Chem./Thermodynamic properties of all 105 elements •Full color graphics for element property comparisons
- Organic Spectroscopic Data, Conversion Tables & more! •IBM Compatibles, 30 Day Guar.\$99.95

SPECTRAL INTELLIGENCE CORP.

30 E. Swedestord Road, Malvern, Pa. 19355
215-889-1349 FAX: 215-889-1630

CIRCLE 33 ON READER SERVICE CARD

STATISTICS

Statistical Advisor Speaks English!

Statistical Navigator Professional™ lets you describe your research goal in plain English, guides you to the appropriate statistical analysis. Natural language interface, detailed report, extensive hypertext help, & pull-down menus. \$150+s/h.

The Idea Works, Inc.

607 Jackson St., Columbia, MO 65203
800-537-4866/314-875-5827/Fax 314-875-5812

CIRCLE 34 ON READER SERVICE CARD

UTILITIES

Break 640K! VRAM™ (\$49)

creates 32M memory by turning disk space or extended memory into expanded! VRAM/plus (8 utilities/\$99): HRAM creates 944K DOS memory, min-mem frees memory used by TSRs, Diskpack backs up 10M to 2 disks, more. Call! 30-day grt.

Biologic

7950 Blue Gray Ct Manassas, VA 22110 USA
703-368-2949 (703-361-8251 fax)

CIRCLE 40 ON READER SERVICE CARD

WINDOWS

Personal Measure

Finds performance bottlenecks in PCs. "can enhance anyone's diagnostics artillery". W. Roach, 8/89 PC Mag. NOW measure and tune Windows 3.0! Most major LANs. Shows you how your apps spend time. \$125+s&h (5.25" or 3.5") MC/VISA.

Spirit of Performance, Inc.

73 Westcott Road, Harvard, MA 01451
tel: 508-456-3889, telex 6503571400

CIRCLE 46 ON READER SERVICE CARD

Business & Statistical Software

Quality Control • Surveys/Questionnaires • Experimental Statistics • Decision Analysis • Optimization • Sales & Market Forecasting Project Planner • Multivariate Analysis • Inventory • Econometrics • Biometrics FREE PRODUCT GUIDE.

Lionheart Press, Inc.

P.O. Box 379, Alburg, VT 05440
Fax: (514) 939-3087 Tel: (514) 933-4918

CIRCLE 35 ON READER SERVICE CARD

GW-BASIC PROGRAMMERS

Write Professional programs for IBM PCs with all the Bells & Whistles! Includes Source for 46 Subroutines & Prog: Bar Menu, Shell Sort, Screen Mgr, Dir Tree....
BASIC Toolbox \$29.50 + 3.50 S/H. MC & VISA

MIPS, INC.

Box 3072 • Hammond, LA 70402
800-345-3808

CIRCLE 41 ON READER SERVICE CARD

MISCELLANEOUS/DISKETTE COPY SVCS.

DUPLICATE DISKS FAST!

DiskDupe copies 2 to 6 times faster than DOS! Reads master once, makes unlimited copies. Stores images on hard disk. Pull-down menus. Automatically formats. 5", 3", high-density. Only \$79, Money Back Guarantee!

MICRO SYSTEM DESIGNS, INC

4962 El Camino, Suite 204, Los Altos, CA 94022
(415) 964-2844 Fax: (415) 964-4529

CIRCLE 47 ON READER SERVICE CARD

NCSS 5.x Series - \$125

"Best value & easiest to learn/use" PC-Week. Menus/Spreadsheet. Means, etc. Regression, t-tests, ANOVA. Factor, cluster & discriminant. Cross tabs. Nonparametrics. Histograms. Plots. Reads ASCII/Lotus. Many extra modules.

NCSS

865 East 400 North Kaysville, UT 84037
Phone: 801-546-0445 FAX: 801-546-3907

CIRCLE 36 ON READER SERVICE CARD

Your Success Is In The Cards...

In the PC Magazine Marketplace BusinessCard pages. Advertise in every issue—pay less and increase impact.

BusinessCard

Call 1-800-825-4237 today.

Hand Your Business Card...

To 786,000+ of the most qualified buyers in the PC market. These brand-specifiers are looking to buy while reading the industry's #1 publication. There is no more cost-effective or efficient way for you to build sales.

BusinessCard

Call 1-800-825-4237 today.



PC MAGAZINE MARKETPLACE

One Park Avenue
Third Floor
New York, NY 10016
Att.: Vickie L. Pinsky

For more advertising
information,
call 212-503-5115
or 1-800-825-4237.

ADVERTISING ACCOUNT MANAGERS

Sr. Account Manager,
Kathleen Morris 212-503-5125
AR, CA (209, 707, 916), CT, IL,
MI, MO, NH, NJ, NM, NV,
OR, WA

Charles Boyar 212-503-5118
AL, CA (415, 818), FL, GA, ID,
KS, VT

Karen Cosgrove 212-503-5156
CA (619, 714, 805), IA, IN, LA,
TN, TX, WI, WY, OVERSEAS

Kevin Downey 212-503-5176
CA (213), DC, MS, NC, SC, UT,
VA, WV

C. Wesley Walton 212-503-5117
CA (408), DE, HI, KY, MD, ME,
MT, NE, MN, OK

Jelane Westra 212-503-5175
AK, AZ, CO, MA, ND, NY, OH,
PA, RI, SD, CANADA

NATIONAL ADVERTISING STAFF

Director, Classified Sales
Paul Stafford

Group Advertising Director
Kathryn J. Cumberlander

Sales Manager
Vickie L. Pinsky

Support Manager
Monica B. Dixon

Sr. Advertising Coordinator
Wanda D. Brown

Production Director
Anne Brockinton

Production Manager
Carolyn Bingham

Production Supervisor
Besai Dion

Production Coordinator
Mary C. Murawinski

READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE	READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE	READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE
AFTER HOURS				427	Byteway 1000 Plus 8P1MB	Protec Microsystems Inc.	317	449	WinList SQL	Humanics Systems Inc.	55
414	Rise of the Dragon	Dynamox Inc.	477	428	Data Shuttle 8400	Q4 Instruments Inc.	318	435	Professor Windows	Individual Software Inc.	49
415	Play It By Ear	Ibis Software	477	429	FastPrint 852U/5X	Rose Electronics	325	437	R-BASE, Version 3.1A	Microm Inc.	60
412	Monkey Island	Lucasfilm Games	477	HARDWARE				440	VIA, Version 2.0	Portable Computing Systems Inc.	60
413	King's Quest V	Sierra On-Line	477	443	W3COM5	Cherry Hill Software	55	432	Recognita Plus, Version 1.1W	Recognita USA Corp.	50
COMMUNICATIONS				442	CN50ET, CN50E, CN50A	CNet Technology Inc.	55	707	SAS for OS/2, Version 6.06	SAS Institute Inc.	38
543	COM-AND, Version 2.7	Caber Software	112	436	Compaq Intelligent Array Expansion System	Compaq Systempro	60	409	Brainstormer, Version 2.21	Soft Path Systems	333
542	BLAST PC, Version 10.2.0	Communications Research Group	111	444	Para-Link Plus starter kit, Model PL3, Para-Link Plus expansion kit, Model PL4	Data Spec	55	439	Faxmerge	3X USA	60
610	CompuServe Information Manager (CIM), Version 1.22	CompuServe	138	445	PrintDirector Gold	Digital Products Inc.	55	TRAINING			
609	AutoSIG (ATO), Version 6.3a	CompuServe IBMCOM forum, library 1	138	447	Mouse Man	Logitech Inc.	55	(HARDWARE HANDBOOKS)			
616	Comet, Version 2.41	CompuServe	176	441	BallPoint Mouse	Microsoft Corp.	55	623	The PC Configuration Handbook, Second Edition	Bantam Computer Books	255
607	Unicom, Version 2.0C	Data Graphics	188	703	The Unmouse	MicroTouch Systems Inc.	49	624	The Winn Rosch Hardware Bible	Brady Computer Books	255
602	ProComm Plus, Version 2.0	Datastorm Technologies Inc.	169	706	OmniKey 101	Northgate Computer Systems	49	(PRINTER PUBLICATIONS)			
544	Crosstalk Communicator, Version 2.0	Digital Communications Associates Inc.	124	431	Minichanger DRM-600	Pioneer Communications of America	50	625	The Printer Bible	Que	256
545	Crosstalk for Windows, Version 1.1	Digital Communications Associates Inc.	128	434	Q-Print, Version 1.1	Quintar Co.	36	626	Tips & Tricks for Your PC Printer	Abacus	256
546	Crosstalk Mk. 4, Version 2.0	Digital Communications Associates Inc.	140	704	Xrcom Parallel Port Multiplexor	Xrcom Inc.	46	(MULTIVENDOR RESOURCES)			
618	Crosstalk XVI, Version 3.71	Digital Communications Associates Inc.	194	446	Cordless Super Mouse	Z-Nix Co. Inc.	55	627	The Laser Printer Handbook	Business One Irwin	258
606	Telx, Version 3.12	Exis Inc.	179	PRINTERS				628	The Hewlett-Packard LaserJet Printer Handbook	Business One Irwin	259
547	DynaComm Asynchronous Edition, Version 3.00.08	Future Soft Engineering Inc.	145	702	EnvelopeJet 250	Business Applications Inc.	55	629	LaserJet Companion, Second Edition	Microsoft Press	259
611	GEne PC Aladin, Version 1.41	General Electric Information Services	138	450	LZR 1650	DataProducts Corp.	55	630	The LaserJet Handbook, Second Edition	Brady Computer Books	259
605	Smartcom Exec, Version 2.0	Hayes Microcomputer Products Inc.	177	700	SPECTRA STAR 430	General Parametrics	55	631	LaserJet IIP Essentials	Peachpit Press	259
619	Smartcom III, Version 1.2	Hayes Microcomputer Products Inc.	194	708	KX-P1123	Panasonic Communication and Systems	55	632	LaserJet Unlimited, Edition II	Peachpit Press	259
548	HyperAccess/5, Version 1.2	Hilgraeve Inc.	146	701	Seikosha BP-5780	Seikosha America Inc.	55	(WHEN YOU DON'T OWN A LASERJET)			
612	Lotus Express, Version 2.0	Lotus Development Corp.	138	710	Seikosha LT-20	Seikosha America Inc.	48	633	DeskJet Unlimited	Peachpit Press	264
550	MTXZ, Version 1.10	MagicSoft Inc.	160	READ ONLY				634	LaserWriter Reference	Addison-Wesley Publishing Co. Inc.	264
620	Relay Gold, Version 4.0	Microcom Inc.	194	396	Undocumented DOS: A Programmer's Guide to Reserved MS-DOS Functions and Data Structures	Addison-Wesley Publishing Co. Inc.	65	(POWER PRINTING GUIDES)			
603	Professional YAM, Version 17.70	Omen Technology Inc.	170	397	Programming Windows, Second Edition	Microsoft Press	65	635	The HP LaserJet Series II Printer Desktop Publishing	Weber Systems Inc.	265
613	RECON, Version 1.80	Optimal Solutions	138	SOFTWARE				636	The LaserJet Font Book	Peachpit Press	265
601	PerLine, Version 3.0	PerLine Data Systems Inc.	166	711	PageMaker 4.0 for Windows	Aldus Corp.	33	637	Laser Printer Powerbooks	Abacus	265
617	The SilverComm Library, Version 2.05	SilverWare Inc.	176	430	AutoShade, Version 2.0	Autodesk Inc.	44	(PROGRAMMERS' CODICES)			
549	Mirror III, Version 2.0	SoftKlone	156	705	Borland C++ 2.0	Borland International	43	638	HP LaserJet Programming	Addison-Wesley Publishing Co. Inc.	268
621	Microphone II for Windows, Version 1.01	Software Ventures Corp.	194	433	PC-File Ready-To-Run Applications	Borland International	48	639	Programming the LaserWriter	Addison-Wesley Publishing Co. Inc.	268
615	TappeT, Version 1.3	Source Code Systems	138	411	The Idea Generator Plus, Version 3.1	Experience in Software Inc.	334	(TRAINING TAPES)			
614	The Access Program for the CompuServe Information Service (TAPCIS), Version 5.3	Support Group Inc.	138	410	IdeaFisher, Version 3.1	Fisher Idea Systems Inc.	334	640	LZR 650—Getting Started	Dataproducts Corp.	269
608	WinComm, Version 1.4	Synapsys	194	438	DynaComm Asynchronous Edition, Version 3.02	Future Soft	60	641	Microsoft Word and Your Laser Printer	ModernVision	269
604	QModem, Version 4.2E	The Fortin Project Inc.	175	709	Superlatives	Graphicus	44	642	WordPerfect and Your Laser Printer	ModernVision	269
COMPUTERS				PRODUCTIVITY				643	WordStar and Your Laser Printer	ModernVision	269
398	AGI 3000B	AGI Computer Inc.	218	DEPARTMENT				PROGRAM NAME / DESCRIPTION			
399	AST Premium II 386SX/20 Model 113V	AST Research Inc.	218	Lab Notes				A Guide to PostScript for Non-PostScript Programmers.			
400	CompuAdd 320sc	CompuAdd Corp.	226	Utilities				Finding and Changing to the Directory You Want, with CDX.COM.			
401	Ultra 386SX-20	Computer Market Place Inc.	227	Environments				Color Complexities and Craziness in Windows 3.0.			
713	Data NB/320SX	Dataworld	56	Power Programming				Exploring Dynamic Data Exchange in Windows 3.0 with WordBASIC.			
402	DT 386SX-20	Diamond Technologies	231	Windows				A program that helps you keep track of graphics files.			
403	Etech 2200	Etech Research Inc.	232	Windows				How applications size and place windows.			
448	LaserPal 386SX	Laser Computer Inc.	55	Windows				Understanding group limits in real mode.			
404	Leading Edge D3/SX20c	Leading Edge Products Inc.	233	Windows				Using the Intel InBoard 386/PC with Windows 3.0.			
405	Micro Express ME 386-SX/20 Caching	Micro Express	234	Databases				How to display more lines on your VGA.			
406	Zenith Z-386 SX/20	Zenith Data Systems	244	Databases				Create dBASE .BIN files using Turbo C.			
712	Zeos Notebook 386SX	Zeos International Ltd.	33	Spreadsheets				Generate batch files using Clipper's low-level I/O commands.			
CONNECTIVITY				Spreadsheets				A Lotus 1-2-3 formula that generates a list of month-ending dates.			
421	Buffalo SL-512	Buffalo Products Inc.	291	The Working Word				Some tips on using text values in LOOKUP functions.			
422	Super Spooler II	Consolink	298	The Working Word				A WordPerfect macro that adds accented characters to documents.			
423	PrintDirector Silver PDSSP	Digital Products Inc.	299	User-to-User				The best way to import Quattro Pro graphs into Microsoft Word.			
424	PrintPoint 6x2	Excelink Inc.	301	Languages				Patch COMMAND.COM to hide or change some of DOS's internal commands.			
425	The Logical Connection	Fifth Generation Systems Inc.	305	Languages				How to play music on your PC using C.			
426	Data Manager XL-100	IMC/Data Manager	315	Languages				Generate unique, date dependent filenames in Turbo Pascal.			
				Connectivity				Speed up your 386 with Shadow RAM.			
				Connectivity				IDE drives offer high performance at modest prices.			
				Connectivity				Keep REMOVE.COM from asking questions.			
				Connectivity				DOS's KEYB command			
				Connectivity				An excellent guide for NetBIOS programmers.			
				Connectivity				A tip for network installers on the go.			
				Connectivity				Maintaining reliable power to your system.			
				Connectivity				Linking LAN operating systems.			



COMING UP

■ PRESENTATION GRAPHICS

The coming of *Windows* has brought change to business graphics programs. Instead of creating individual charts and stringing them together, you can now manage presentations in an integrated environment. But do you need the latest technical innovations? In this review, *PC Magazine* looks at 12 presentation graphics packages, including *Microsoft PowerPoint*, Lotus's *Freelance Graphics for OS/2*, and a host of older packages.

■ CLIP ART

Looking for just the picture to spice up your presentation? You should be able to find it in one of the 21 collections of clip art reviewed in this story. All are in vector formats, and are reviewed for ease of editing and re-coloring, which lets you make them truly your own.

■ SLIDE SERVICE BUREAUS

Slides are becoming easier and easier to make, in large part because slide service bureaus can deliver them right from your graphics program to your doorstep. Here, we review five prominent national slide service bureaus that have bundling arrangements with graphics software companies, and we also take a look at how to choose a local service.

■ FILM RECORDERS

Should you buy a desktop film recorder? With prices under \$9,000, the security and control of rolling your own is certainly attractive. But are they easy enough to use to make this worthwhile? To find out, check out *PC Magazine Labs'* review of four low-cost film recorders.

■ BIG-SCREEN MONITORS

Make a big impression with these 25- to 35-inch direct-view monitors. Supporting VGA applications and VHS video tape, these ten dynamic displays from Barco, Mitsubishi, and NEC are perfect for graphics presentations, video conferences, sales seminars, and training programs. ■

Haven't You Heard the News?



You don't have to buy the whole newsstand to get copies of your latest article or review. Order customized reprints from Ziff-Davis Publishing Co. and let potential clients read all about it.*

To find out how you can have your article or review reprinted, contact Claudia Hardison—Reprints Manager; Ziff-Davis Publishing Company, One Park Ave., New York, NY 10016, 212-503-5447.

*Minimum quantity 500 reprints.

R/S#	ADVERTISER	PRODUCT	PAGE#	R/S#	ADVERTISER	PRODUCT	PAGE#
ACCOUNTING SOFTWARE							
263	Macole Inc.	ACCOUNTING SOFTWARE	108-109	378	Imagex Corporation	BERNOULLI BOX DRIVES	230-231
DATABASE MANAGERS				COMPUTERS/COMPATIBLES			
315	Ashion Tale	dbase IV, 1.1	22-23	519	Acer America Corporation	PC	341
186	Concentric Data Systems	R&R RELATIONAL REPORT WRITER	342	185	Acme Computers, Inc.	ACMA PCS	64
186	Database International	DATABASE MANAGERS	306	185	Advanced Logic Research	ALR SX POWER FLEX	2-3
186	Oracle	DATABASE	94	508	AST Research	386SX/20 PC	248
FILE SYSTEMS & ACCESS METHODS				508	Austin Computers	PC'S	9-13
286	Fifth Generation	DISKLOCK	26	273	Bus Computer	MAIL ORDER	437
FINANCIAL PLANNING SOFTWARE				137	COMP USER	HARDWARE, SOFTWARE, PERIPHERALS	70-71
1	Initial Software	QUICKEN	38	189	Comp. Discount Warehouse (WMC)	COMPATIBLES	438-439
INFORMATION MANAGERS				1	Compu-Add	333T	363-368
315	Concentric Data Systems	R&R RELATIONAL REPORT WRITER	342	1	Compu-Add	325, 386 SX	294-297
INTEGRATED SOFTWARE				1	Compu-Add	320SC	248-247
308	Enable Software Inc.	INTEGRATED SOFTWARE	219	1	Datavorld	PC'S	221
344	Symantec	QMA	371	536	Dell Computer Corporation	DELL PC'S	5-CB
LANGUAGES				472	Dell Computer Corporation	DELL PC'S	463-484
295	Borland International	OBJECT VISION	57	532	Dell Computer Corporation	DELL PC'S	198-201
287	Borland International	BORLAND C++	59	474	Dell Computer Corporation	DELL PC'S	204-205
1	Mark Williams	COHERENT UNIX OPERATING SYSTEM	77	102	Digital Equipment Corporation	DELL PC'S	202-203
OPERATING SYSTEMS/ENVIRONMENTS				118	Digital Equipment Corporation	PC'S	84-85
239	Digital Research Inc.	DR DOS	116-117	479	DTK Computers	PC'S, COMPATIBLES	198
1	Hewlett Packard Network Sys.	HEWLETT PACKARD NEW WAVE	339	525	EMS Systems International	MAIL ORDER	448
1	Mark Williams	COHERENT UNIX OPERATING SYSTEM	77	1	Ergo Computing Inc.	PC'S	228-229
383	Software Link, Inc.	WINDOWS SOFTWARE	18-19	1	Gateway 2000	COMPATIBLES	48-55
255	Wordstar International	WORDSTAR LEGACY	252	480	Hyundai	PC'S	72-73
PROGRAM DEVELOPERS/GENERATORS				480	IBM Corp.	AS/400	62-63
295	Borland International	OBJECT VISION	57	480	Inversion Computer Corporation	PC COMPATIBLES	400-401
PROJECT MANAGEMENT				242	Inversion Computer Corporation	PC COMPATIBLES	403
148	Primavera Systems	PROJECT MANAGEMENT SOFTWARE	88	1	Microway	CO-PROCESSORS	245
UTILITIES				242	MCR Corporation	PC'S	222-223
335	Application Techniques	PIZZAZ PLUS	243	1	Northgate Computer Systems	COMPATIBLES	346-350
328	Buffalo Products	PRINTING & FILE UTILITY TRANSFER	326	1	Northgate Computer Systems	COMPATIBLES	352-353
315	Concentric Data Systems	R&R RELATIONAL REPORT WRITER	342	1	Northgate Computer Systems	COMPATIBLES	355
232	Fifth Generation	FILE DIRECTOR	328	1	Northgate Computer Systems	COMPATIBLES	357
232	Fifth Generation	FASTBACK PLUS	187	1	Northgate Computer Systems	COMPATIBLES	359
238	Fifth Generation	FASTBACK PLUS	189	145	Paradise Computer Products Ltd	PC'S	443
254	Symantec	ANTI-VIRUS	51	303	PC Brand	PC'S	274-281
WORD PROCESSING SOFTWARE/AIDS				297	Standard Computer (CPU)	PC'S	97
315	Concentric Data Systems	R&R RELATIONAL REPORT WRITER	342	163	Standard Computer (CPU)	PC'S	98-99
143	Lotus - Word Processing Div.	WORD PROCESSOR	141-144	298	Swan Technologies	MAIL ORDER	161-164
1	Software Publishing	PROWRITE	61	508	Tandon Computer Corporation	COMPATIBLES	180-181
CAD/CAM				744	Tandon Computer Corporation	COMPATIBLES	182-183
508	Generic Software	GENERIC CADD 5.0	309	312	Tandon Computer Corporation	COMPATIBLES	184-185
260	Humancad	MANNEQUIN	318-319	381	Tangent Computer, Inc.	PC'S	105
SPREADSHEET/TEMPLATES				206	Teleart	PC'S	80-83
1	Microsoft	EXCEL 3.0	C2-C4	306	Tenex Computer Express	MAIL ORDER	444
1	Microsoft	EXCEL 3.0	1	379	Toshiba of America	T2000SX LAPTOP	125-127
FOREIGN SOFTWARE				121	Tri-Star Computer	COMPUTERS/COMPATIBLES	17
511	MicroTas Software	SPANISH ASSISTANT	380	177	Ultra Corp.	COMPATIBLES	40-41
DESK TOP PUBLISHING				732	Zenith Data Systems	COMPATIBLES	5
269	SWFTE International	GLYPHIX	37	486	Zos International	ZEOS NOTEBOOK	30-31
EDUCATIONAL SOFTWARE				722	Zos International	COMPATIBLES	78-79
186	PC Globe	BUSH BUCK	16	723	Zos International	Z-CARD	137
ENTERTAINMENT SOFTWARE				1	Zos International	COMPATIBLES	129-136
186	PC Globe	BUSH BUCK	16	721	Zos International	COMPATIBLES	208-216
FORM DESIGNERS				386	Zos International	COMPATIBLES	250-251
258	Delrina Technology	PERFORM 2.1	76	INPUT DEVICES			
FONT SOFTWARE				190	Key Tronic	KEYBOARD	336
131	Baldern	TYPE CITY	391	182	Logitech	MouseMan	335
MAPPING SOFTWARE				1	Microsoft	BALLPOINT	148-149
258	Golden Software, Inc.	MAPPING	21	1	Microsoft	MOUSE	302-303
1	Wordperfect	GEOGRAPHIC	52-53	238	Softworks Development Corp	BEETLE MOUSE	324
FLOWCHARTING				PROGRAMMERS TOOLS UTILITIES			
301	Pelton & Pelton	FLOW CHART	385	1	Mark Williams	COHERENT UNIX OPERATING SYSTEM	77
124	Roylone, Inc.	ABC FLOWCHARTER	112	128	Capital Equipment Corporation	ADD-IN BOARDS	380
WINDOWS SOFTWARE				276	Hauptpage Computer Works, Inc.	486 MOTHERBOARDS	32
1	Hewlett Packard Network Sys.	HEWLETT PACKARD NEW WAVE	339	180	Sigma Data	ADD-ON BOARDS	248
143	Lotus - Word Processing Div.	WORD PROCESSOR	141-144	PRINTERS			
1	Microsoft	EXCEL 3.0	C2-C4	328	Buffalo Products	PRINTER SHARING DEVICE	325
1	Microsoft	EXCEL 3.0	1	155	Canon, USA	BJ 10E BUBBLE JET PRINTER	380
124	Roylone, Inc.	18C FLOWCHARTER	112	281	Datasouth Computer Corp.	PRINTERS	282
255	Wordstar International	WORDSTAR LEGACY	252	382	Eastman Kodak	EKTRAPLUS 7016	331
COMPATIBLE KEYBOARDS				1	Hewlett Packard Peripheral Group	LASER PRINTER	305-307
273	Bus Computer	MAIL ORDER	437	1	Hewlett Packard Peripheral Group	PAINTJET	270-271
1	Northgate Computer Systems	KEYBOARDS	357	1	IBM Corp.	LASER PRINTERS	89
115	Northgate Computer Systems	JYBOARDS	359	279	Konica Business Machines	PRINTER	257
1	Zos International	ZEOS NOTEBOOK	29	235	Okidata	LED PAGE PRINTER	288-289
BACKUP SOFTWARE				259	QMS	LASER PRINTERS	43
236	Fifth Generation	FASTBACK PLUS	187	164	QMS	LASER PRINTERS	45
DISK BACKUP & TAPE DRIVES				141	QMS	LASER PRINTERS	47
521	3M Data Storage Products	FASTBACK PLUS	189	290	Rose Electronics	PRINTER SHARING SWITCHES	262
				1	Seko Instruments	PRINTERS	120-121
				479	FONT CARTRIDGES		
				325	IQ Engineering	FONT CARTRIDGES	287
				TRACK BALLS			
				238	Softworks Development Corp	BEETLE MOUSE	324
				PRINTER ACCESSORIES			
				727	ASP Computer Products	PRINTER SHARE	273
				498	Bay Technical Associates	DATA EXCHANGE SYSTEM MODEL 24	340
				384	Bay Technical Associates	PRINT MASTER	402
				140	Bay Technical Associates	PRINT MASTER	418
				270	Pacific Data Products	PACIFIC CONNECT	290
				PORTABLE/LAP COMPUTERS			
				328	Western Telematic	LASER NET PRODUCT FAMILY	291
				273	Buffalo Products	TOSHIBA MEMORY BOARDS	328
				479	Bus Computer	MAIL ORDER	437

ADVERTISERS' INDEX PRODUCTS

R/S#	ADVERTISER	PRODUCT	PAGE#	R/S#	ADVERTISER	PRODUCT	PAGE#
217	NEC Technologies, Inc.	ProSpeed SX/20	368	498	Bay Technical Associates	PRINT MASTER	340
316	Samsung Information Systems	LAPTOP	386	364	Bay Technical Associates	LaserShare	402
287	Standard Computer (CPU)	NOTEBOOK PC	97	140	Bay Technical Associates	PRINT MASTER	418
163	Standard Computer (CPU)	NOTEBOOK PC	96-99	328	Buffalo Products	PRINTER SHARING DEVICE	326
508	Tandon Computer Corporation	PORTABLES	161-182	228	Invisible Software	LAW	96
744	Tandon Computer Corporation	PORTABLES	182-183	342	Protac Microsystems, Inc.	BYTELINK	283
312	Tandon Computer Corporation	PORTABLES	184-185	290	Rose Electronics	Master Switch	282
353	Texas Instruments	TRAVELMATE 2000	332	270	Western Telestatic	LASER NET PRODUCT FAMILY	291
379	Toshiba of America	T2000SX LAPTOP	125-127				
732	Zenith Data Systems	LAPTOPS	5				
115	Zos International	ZEOS NOTEBOOK	29				
488	Zos International	ZEOS NOTEBOOK	30-31				
PC-FAX				DISKETTES			
374	Intel (PCFD)	FAX MODEM	263		Maxell	FLOPPY DISKS	82
	Intel (PCFD)	FAX MODEM	261				
CO-PROCESSORS				POWER PROTECTION			
512	Intel Corporation	MATH CO-PROCESSOR	361-363	220	Kensington Microware Ltd.	MASTERPIECE	404
	Micro	CO-PROCESSORS	245				
343	Performance Memory Products	CO-PROCESSORS	444				
OPTICAL PERIPHERALS				SECURITY			
144	Corel Systems	COREL OPTICAL PRODUCTS	384	286	Fifth Generation	DISLOCK	28
MEMORY SUBSYSTEMS				MAIL ORDER			
144	Corel Systems	COREL OPTICAL PRODUCTS	384		Acma Computers, Inc.	ACMA PC'S	64
378	Omega Corporation	BERNOULLI BOX	230-231	336	Arlington Computer Products	MAIL ORDER	428
127	JDR Micro Devices	MEMORY	440	509	Austin Computers	MAIL ORDER	9-13
343	Performance Memory Products	MEMORY	444	461	Bulldog Computer Products	MAIL ORDER PRODUCTS	445
306	Tenex Computer Express	MEMORY PRODUCTS	444	180	Bureau of Electronic Publishing	CD-ROM	4
CD-ROM				273	Bus Computer	MAIL ORDER	437
180	Bureau of Electronic Publishing	CD-ROM	4	132	COMP USER	HARDWARE, SOFTWARE, PERIPHERALS	70-71
144	Corel Systems	COREL OPTICAL PRODUCTS	384	109	Comp. Discount Warehouse (NMIC)	MAIL ORDER	438-439
CHIPS/PROCESSORS					Compu-Add	SX PORTABLE	171-174
197	Advanced Micro Devices	CO-PROCESSOR	441		Compu-Add	333T	363-368
512	Intel Corporation	MATH CO-PROCESSOR	361-362		Compu-Add	325, 366 SX	294-297
182	Integrated Information Tech.	MATH CO-PROCESSOR	320	205	Compucalcs	MAIL ORDER SOFTWARE	432
	Micro	CO-PROCESSORS	245	300	Computability	MAIL ORDER	447
DISPLAYS/MONITORS/TERMINALS				536	Dell Computer Corporation	DELL PC'S	5-8
283	Nemco, USA Corp.	MONITORS	168	472	Dell Computer Corporation	DELL PC'S	483-484
153	NEC Technologies, Inc.	MultiSync Monitors	24-25	522	Dell Computer Corporation	DELL PC'S	196-201
531	Nissen Sanyo America, Ltd.	MONITORS	20	474	Dell Computer Corporation	DELL PC'S	204-205
746	Panasonic OA C1381 PANASYNC	MONITOR	54	347	Dustin Discount Software	DELL PC'S	202-203
286	SAMTRON	MONITORS	66	118	EMS Systems International	MAIL ORDER SOFTWARE	14
480	Sello Instruments	MONITORS	421	479	Ergo Computing Inc.	MAIL ORDER	448
GRAPHICS SOFTWARE					EXCEL MICRO	MAIL ORDER	229-233
	Ashlon Tate	DRAW APPAUSE II	258-259	352	FASTIMICRO	MAIL ORDER	442
729	Corel Systems	COREL DRAW	110	382/320	First Source International	MAIL ORDER	428-431
280	Humandac	MANEQUIN	318-319		Gateway 2000	MAIL ORDER	446
	Micrographix	DESIGNER	113	127	Hard Drives International	MAIL ORDER	484-484
	Wordperfect	GEOGRAPHIC	52-53	225	JDR Micro Devices	MAIL ORDER	427
VIDEO GRAPHICS/BOARDS					MicroWarehouse Inc.	MAIL ORDER	180-183
337	ATI Technologies Inc.	8514ULTRA	395		Micro	CO-PROCESSORS	245
COMMUNICATIONS SOFTWARE				488	Midwest Computer Works	MAIL ORDER	436
328	Buffalo Products	PRINTING & FILE UTILITY TRANSF.	326		Northgate Computer Systems	MAIL ORDER	346-350
504	DATASTORM Technologies Inc.	PROCOMM PLUS 2.0	107		Northgate Computer Systems	MAIL ORDER	352-353
278	DCA	CROSSTALK	167		Northgate Computer Systems	MAIL ORDER	355
332	Dynamic Microprocessor Assoc.	PCANYWHERE IV	74		Northgate Computer Systems	MAIL ORDER	357
271	KEA Systems Ltd.	ZSTEM	272	145	Northgate Computer Systems	MAIL ORDER	359
290	Rose Electronics	COMMUNICATIONS SOFTWARE	262		Paradise Computer Products Ltd	MAIL ORDER	443
LOCAL AREA NETWORKING				303	PC Brand	MAIL ORDER	274-281
234	3X USA	SX-LINK 16	266		PC Connection	MAIL ORDER	236-241
254	Artisoft	LANTASTIC	372		PC Zones Int'l. Inc.	SOFTWARE/MAIL ORDER	313-314
371	Bay Technical Associates	DATA EXCHANGE SYSTEM MODEL 24	265	343	Performance Memory Products	MAIL ORDER	444
364	Bay Technical Associates	PRINT MASTER	402	265	S&W Electronics	MAIL ORDER	442
488	Bay Technical Associates	LaserShare	340	373	Software Add-Ons	MAIL ORDER	435
140	Bay Technical Associates	PRINT MASTER	418	258	Swan Technologies	MAIL ORDER	161-164
328	Buffalo Products	PRINTER SHARING DEVICE	326	206	Telemart	MAIL ORDER	90-93
	Compu-Add	333T	363-366	306	Tenex Computer Express	MAIL ORDER	444
389	DCA	DCA INMATIC TOKEN-RING	412	177	Ultra Comp	MAIL ORDER	40-41
113	Everex	STEP MEGACUBE - 406 SERVER	151-155	115	Zos International	ZEOS NOTEBOOK	29
126	Future Soft Engineering	DYNACOMM	206	722	Zos International	COMPATIBLES	78-79
146	Gateway Communications	ETHERNET BOARD	372	388	Zos International	COMPATIBLES	310-311
526	WCR Corporation	WAVE LAN	268-269	488	Zos International	ZEOS NOTEBOOK	30-31
322	Novell Data Systems	NETWARE	322-323	723	Zos International	2-CARD	137
	Pacific Data Products	PACIFIC CONNECT	290		Zos International	COMPATIBLES	129-136
342	Protac Microsystems, Inc.	BYTELINK	283		Zos International	COMPATIBLES	208-216
280	Rose Electronics	PERIPHERAL SHARING SWITCHES	262	721	Zos International	COMPATIBLES	250-251
MICRO-MAINFRAME LINKS				ON LINE DATABASES			
126	Future Soft Engineering	DYNACOMM	206		Checkfree Technology Inc.	ON LINE CHECK CASHING	185
MODEMS					Dow Jones Information Services	DOW JONES NEWS RETRIEVAL	147
540	ATI Technologies Inc.	2400, 9600 MODEMS	267	BOOKS			
319	Cardinal Technologies	MODEMS	100	311	The Computer Book Club	BOOK CLUB	415-417
200	Communications Research Group	MODEM	265				
749	Intel (PCFD)	MODEMS	316-317				
106	Multi Tech Systems	MODEMS	292				
367	Universal Data Systems	MODEMS	422				
EMULATORS/PROTOCOL CONVERTERS				UNIX PRODUCTS			
271	KEA Systems Ltd.	ZSTEM	272		Mark Williams	COHERENT UNIX OPERATING SYSTEM	77
MULTIUSER SYSTEMS				171	SpectraGraphics Corporation	PC-X VIEW	28
342	Protac Microsystems, Inc.	COHERENT UNIX OPERATING SYSTEM	77	ORGANIZATIONS			
290	Rose Electronics	BYTELINK	283	114	Kelly Temporary Services	TEMPORARY SERVICES	382
		Master Switch	282	DIRECT MARKETING CONNECTION			
SOFTWARE MEDIA SHARING				187	Advanced Micro Devices	CO-PROCESSOR	441
234	3X USA	SX-LINK 16	266	336	Arlington Computer Products	MAIL ORDER	428
PERIPHERAL SHARING DEVICE				461	Bulldog Computer Products	MAIL ORDER PRODUCTS	445
727	ASP Computer Products	PRINTER SHARE	273	273	Bus Computer	MAIL ORDER	437
371	Bay Technical Associates	DATA EXCHANGE SYSTEM MODEL 24	265	109	Comp. Discount Warehouse (NMIC)	MAIL ORDER	438-439
				205	Compucalcs	MAIL ORDER SOFTWARE	432
				300	Computability	MAIL ORDER	447
				118	EMS Systems International	MAIL ORDER	448
				352	EXCEL MICRO	MAIL ORDER	442
				382/320	FASTIMICRO	MAIL ORDER	428-431
				127	First Source International	MAIL ORDER	446
				488	Hard Drives International	MAIL ORDER	427
				145	JDR Micro Devices	MAIL ORDER, MEMORY	440
				343	Midwest Computer Works	MAIL ORDER	436
				265	Paradise Computer Products Ltd	PC'S, MAIL ORDER	443
				373	Performance Memory Products	MAIL ORDER, MEMORY, CO PROCESSOR	444
				306	S&W Electronics	MAIL ORDER	442
				311	Software Add-Ons	MAIL ORDER	435
					Tenex Computer Express	MAIL ORDER, MEMORY PRODUCTS	444
					The Computer Book Club	BOOK CLUB	415-417



ADVERTISING SALES STAFF

One Park Avenue, New York, NY 10016
(212) 503-5100

DISPLAY ADVERTISING

NATIONAL

Nancy Newman -
Director of Sales /
Telemarketing
(212) 503-5204

Telemarketing Manager
MaryJo Boudinot
(212) 503-5128

Senior Advertising Coordinator
Allyson Dubin
(212) 503-5044

Advertising Coordinator
Christine Holsten
(212) 503-5264

Ast. Advertising Coordinator
Lynette Stiffa
(212) 503-5107

EASTERN

Al Di Guido - Eastern
Advertising Manager
(212) 503-5310

MA, NH, VT, ME, RI

District Manager
Sloan Seymour
(617) 393-3055
10 President's Landing, Mystic Center
Medford, MA 02155
Account Representative
Todd Anderman
(212) 503-5132

CT, NY, NJ, PA

District Manager
Michael Bird
(212) 503-5307
District Sales Representative
Lisa Friedman
(212) 503-5149
One Park Avenue, 4th Floor
New York, NY 10016
Sr. Account Representative
Joyce Wasserman
(212) 503-5333
Account Representative
Stephanie Brzozowski
(212) 503-5675

DE, MD, DC, VA, WV, NC, SC, AL,
MS, TN, AR, KY, GA, FL

District Manager
Scott J. Seltz
District Sales Representative
Mark Crafts
3405 Piedmont Road, Suite 460
Atlanta, GA 30305
(404) 239-9780
Account Representative
John DeSpirito
(212) 503-5130

For more information
regarding *display*
advertising please call:
(212) 503-5100 or
1-800 PCMAG AD

CENTRAL

Robert Diftler - Central
Advertising Manager
(312) 346-7666

NE, WI, IL, IN, KS, MN, MO, OH,
MI, IA, ND, SD, Canada

District Manager
Stephen Dress
District Manager
Jay Overbye
150 North Wacker Drive, 25th Floor
Chicago, IL 60606
(312) 346-7666
Account Representative
Maureen Dooley
(212) 503-5126
Account Representative
Chris Sullivan
(212) 503-5047

TX, OK, LA, NM

Dallas Office
5956 Sherry Lane, Suite 625
Dallas, TX 75225
(214) 691-6934
Account Representative
Karen Keavey
(212) 503-5104

WESTERN

CA (Los Angeles)

District Manager
Mary Ariotto (213) 351-1811
District Manager
Paul Klein (213) 351-1812
3530 Wilshire Boulevard, Suite 645
Los Angeles, CA 90010
(213) 351-1810
Sr. Account Representative
Beth Gartenberg
(212) 503-5040

WESTERN

Ted Welch - Associate
Publisher/West Coast
(415) 378-5525

CA (San Francisco & North), ID,
OR, WA

District Manager
Mike Kisseberth
(415) 378-5527
District Sales Representative
Rick Vandervoorn (415) 378-5523
110 Marsh Drive, Suite 103
Foster City, CA 94404
Account Representative
Deborah Gatton
(212) 503-5129

CA (Santa Barbara to South San
Francisco), WY, MT, AK, CO, UT

District Manager
Pete Foster (415) 378-5521
District Manager
Kim Dawson (415) 378-6859
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520
Account Representative
John Zaterka
(212) 503-5041

CA (San Diego & Orange County),
AZ, NV, HI

District Manager
David Lynn
District Sales Representative
Robin Kofsky
18500 Von Karman Avenue, Suite 510
Irvine, CA 92715
(714) 852-8001
Sr. Account Representative
Michael Hatherill
(212) 503-5113

CLASSIFIED ADVERTISING

Director, Classified Sales
Paul Stafford

Group Advertising Director
Kathryn J. Cumberlander

Sales Manager
Vickie L. Pinsky

Support Manager
Monica B. Dixon

Sr. Advertising Coordinator
Wanda D. Brown

Production Director
Anne Brockinton

Production Manager
Carolyn Bingham

Production Supervisor
Bessi Dion

Production Coordinator
Mary C. Murawinski

AR, CA (209, 707, 916), CT,
IL, MI, MO, NH, NJ, NM, NV,
OR, WA

Sr. Account Manager
Kathleen Morris
212-503-5125

AL, CA (415, 818), FL, GA, ID,
KS, VT

Charles Boyar
212-503-5118

CA (619, 714, 805), IA, IN, LA, TN,
TX, WI, WY, OVERSEAS

Karen Cosgrove
212-503-5156

CA (213), DC, MS, NC, SC, UT,
VA, WV

212-503-5176

CA (408), DE, HI, KY, MD, ME,
MT, NE, MN, OK

C. Wesley Walton
212-503-5117

AK, AZ, CO, MA, ND, NY, OH,
PA, RI, SD, CANADA

Jelane Westra
212-503-5175



PC MAGAZINE MARKETPLACE
3rd Floor, One Park Avenue,
New York, NY 10016

For more information
regarding *classified*
advertising please call:
(212) 503-5115 or
1-800 825-4237

Products for the Leisure Side of Personal Computing

GAMES
by Don Trivette

APRIL 30, 1991 PC MAGAZINE 477

After Hours

Adventure Games

CONTINUED

when you are in "Look at" mode, the cursor turns into an eye. Clicking the eye on an object gives you a description. The right mouse button rotates through the commands. This new Sierra interface is the best I've seen for a PC-based adventure game.

King's Quest V has spectacular, detailed animation that employs some of the same techniques used in animated features like *The Little Mermaid*. Sierra's artists videotaped live actors, and the images were used as a framework around which to construct the animation. The down side of such realism is the length of time it takes to load a scene, which can run 8 to 10 seconds on a slow computer. Music and sound effects were designed into the action and are part of the story line.

If you can buy only one of

these games, it's a toss up. *Monkey Island* has more difficult puzzles than *King's Quest V*. Almost nothing will kill Guybrush Threepwood, while King Graham is refreshingly mortal. *KQ V* has a super player interface, but the scenes are slow loading; *MI*'s scrolling scenery is a nifty innovation. Both games come in spectacular 256-color versions for users with VGA cards, but *King's Quest*'s graphics are clearly superior. Both games have theater-quality sound (with optional music cards), and clever story lines. The final selection boils down to whether you would prefer to be a pirate or a king.

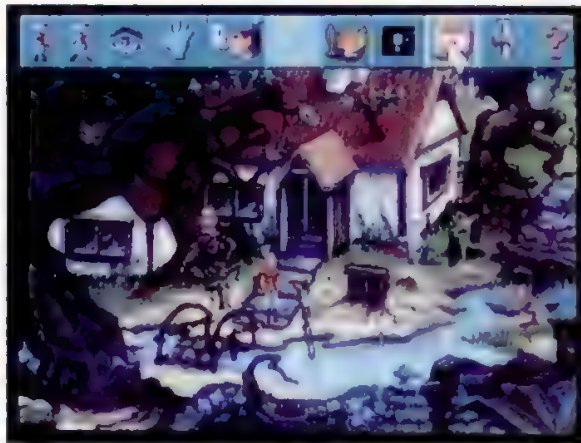
List Price: *Monkey Island*, \$69.95 for 256-color version; \$59.95 for 16-color version. **Requires:** 640K RAM; CGA, EGA, VGA, MCGA, or Tandy 16-color graphics; hard disk recommended (required for 256-color version). Lucasfilm Games, P.O. Box 10307, San Rafael, CA 94912; 415-662-1902.

CIRCLE 412 ON READER SERVICE CARD

List Price: *King's Quest V*, \$69.95 for the 256-color version; \$59.95 for the 16-color version. **Requires:** for the 256-color version: 640K RAM; VGA and MCGA graphics only; 80286 or 80386 processor

required; for the 16-color version: 512K RAM; EGA, VGA, MCGA, or Tandy 16-color graphics. Sierra On-Line, P.O. Box 485, Coarsegold, CA 93614; 800-326-6654.

CIRCLE 413 ON READER SERVICE CARD



The latest in Roberta Williams' *King's Quest* series adds a new, point-and-click interface and 256-color graphics.

ONE STEP CLOSER TO PC CINEMA: Adventure Games That Talk to You

by Don Trivette

Sometime in 1991 Sierra will begin selling a new version of *King's Quest V*. The story line and the graphics will be the same, but the text will be missing. Instead of reading what the Ice Queen has to say, you'll hear it directly from her frigid lips. King Graham will no longer be a little voice inside your head, but rather a real voice booming from speakers attached to your computer.

Your favorite adventure games are about to get speech, courtesy of CD-ROM technology. The same shiny, aluminum-coated disk that holds about an hour of music can store the equivalent of 500 floppy disks. That's a lot of data, but it's not enough to permit all the speech from *King's Quest V* to be recorded as direct audio on a CD; a voice-sampling technique will compress the

speech so everything fits on a single CD-ROM.

With *King's Quest V* now distributed on ten high-density floppy disks, the CD-ROM format represents an obvious convenience for both the company and the player. People with appropriate hardware won't have to install the game on a hard disk; they will simply slide the CD-ROM into a player and begin. Although CD-ROM players are still expensive, the price could fall to about \$100 in large volume production.

King's Quest V won't be Sierra's first talkie. A CD-ROM version of *Mixed-up Mother Goose* has been selling in Japan since late 1990, where CD-ROM players are more common. As of this writing, the U.S. release of a talking version of *Mother Goose* was scheduled for early April, 1991, and will cost about \$60. ■

GAMES by Tom Ungar

Okay, okay, so we've seen this plot before. Ever since the release of the futuristic fantasy flick *Blade Runner*, a barrage of computer games have simulated a private dick's attempts to save the world from the scourge of *this* or the threat of *that*. You invariably find yourself smack in the middle of grimy, crime-ridden, drug-sucking, 21st-century Los Angeles. And you've got just four days to save the city. Yawn. Another weekend shot to hell.

So why plunk down 79 bucks for Dynamix's newest thriller, *Rise of the Dragon*? Because while *Rise* may not be wholly original, it is at the very least an extraordinarily rendered representation of the future "Age of Decay." This release stands out not because of its story line, but rather because Dynamix (which was recently acquired by Sierra On-Line) has constructed a marvelously interactive gaming environment.

The action is set in Los Angeles, circa 2053. In the midst of the general decay and decadence, a Chinese villain, Bahumat (known in myth as "The Dragon"), has risen from the ether to rain chaos down upon the otherwise occupied and unsuspecting human population. How? By concocting a drug that at first mimics a typical narcotic, but then proceeds to mutate every cell in your body.

IMPRESSIVELY UGLY

The very unpleasant results of abusing this substance are depicted with gruesome accuracy by *Dragon*'s hand-painted, 256-color graphics. Even as the mutations disgust you, you'll be impressed by the convincing realism of the visuals. When the drug (known as "MTZ") is done with its victims, they are very dead and very ugly.

You are William "Blade" Hunter, ex-L.A. police detective whose unorthodox methods forced him into early retirement and a career change to private

CONTINUES

ADVERTISERS' INDEX

COMPANIES

R/S#	ADVERTISER	PAGE	R/S#	ADVERTISER	PAGE	R/S#	ADVERTISER	PAGE
521	3M Data Storage Products	377	113	Everex	151-155	*	Northgate Computer Systems	355
234	3X USA	266	*	EXCEL MICRO	442	*	Northgate Computer Systems	357
519	Acer America Corporation	341	352	FASTMICRO	428-431	*	Northgate Computer Systems	359
*	Acma Computers, Inc.	64	286	Fifth Generation	26	322	Novell Data Systems	322-323
165	Advanced Logic Research	2-3	*	Fifth Generation	187	235	Okidata	288-289
197	Advanced Micro Devices	441	236	Fifth Generation	189	*	Oracle	94
335	Application Techniques	243	232	Fifth Generation	328	303	PC Brand	274-281
336	Arlington Computer Products	426	382/320	First Source International	446	*	PC Connection	236-241
254	Artisoft	372	126	Future Soft Engineering	206	188	PC Globe	16
*	Ashton Tate	22-23	*	Gateway 2000	48A-H	*	PC Zones Int'l. Inc.	313-314
*	Ashton Tate	258-259	146	Gateway Communications	374	*	Pacific Data Products	290
727	ASP Computer Products	273	506	Generic Software	399	746	Panasonic OA	54
166	AST Research	248	258	Golden Software, Inc.	21	145	Paradise Computer Products Ltd.	443
540	ATI Technologies Inc.	267	*	Hard Drives International	427	301	Patton & Patton	385
337	ATI Technologies Inc.	395	276	Hauppauge Computer Works, Inc.	32	343	Performance Memory Products	444
509	Austin Computers	9-13	*	Hewlett Packard Network Systems	339	148	Primavera Systems	68
371	Bay Technical Associates	265	*	Hewlett Packard Peripheral Group	270-271	342	Protec Microsystems, Inc.	293
498	Bay Technical Associates	340	*	Hewlett Packard Peripheral Group	306-307	259	QMS	43
364	Bay Technical Associates	402	260	Humancad	318-319	164	QMS	45
131	Bitstream	391	525	Hyundai	72-73	141	QMS	47
295	Borland International	57	*	IBM Corp.	62-63	290	Rose Electronics	262
287	Borland International	59	*	IBM Corp.	89	124	Roykore, Inc.	112
328	Buffalo Products	326	*	Intel (PCEO)	261	265	S&W Electronics	442
481	Bulldog Computer Products	445	*	Intel (PCEO)	263	296	SAMTRON	66
180	Bureau of Electronic Publishing	4	749	Intel (PCEO)	316-317	316	Samsung Information Systems	386
273	Bus Computer	437	512	Intel Corporation	381-383	*	Seagate	378
155	Canon, USA	368	192	Intergrated Information Tech.	320	*	Seiko Instruments	120-121
128	Capital Equipment Corporation	360	*	Intuit Software	39	490	Seiko Instruments	421
319	Cardinal Technologies	100	228	Invisible Software	96	160	Sigma Data	249
*	Checkfree Technology Inc.	195	378	Iomega Corporation	230-231	373	Software Add-Ons	435
200	Communications Research Group	265	325	IQ Engineering	287	393	Software Link, Inc.	80
109	Comp. Discount Warehouse (MMC)	438-439	480	Iverson Computer Corporation	400-401	*	Software Publishing	61
132	COMP USER	70-71	480	Iverson Computer Corporation	403	238	Softworks Development Corp	324
*	Compu-Add	171-174	127	JDR Micro Devices	440	171	Spectragraphics Corporation	28
*	Compu-Add	246-247	271	KEA Systems Ltd.	272	297	Standard Computer (CPU)	97
*	Compu-Add	294-297	114	Kelly Temporary Services	392	163	Standard Computer (CPU)	98-99
*	Compu-Add	363-366	220	Kensington Microware Ltd.	404	268	Swan Technologies	161-164
205	Compuclassics	432	190	Key Tronic	336	299	SWFTE International	37
300	Computability	447	279	Konica Business Machines	257	264	Symantec	51
315	Concentric Data Systems	342	182	Logitech	335	344	Symantec	371
729	Corel Systems	110	143	Lotus - Word Processing Div.	141-144	508	Tandon Computer Corporation	180-181
144	Corel Systems	384	263	Macola Inc.	108-109	744	Tandon Computer Corporation	182-183
504	DASTORM Technologies Inc.	107	*	Mark Williams	77	312	Tandon Computer Corporation	184-185
278	DCA	167	*	Maxell	82	391	Tangent Computer, Inc.	105
389	DCA	412	511	MicroTac Software	360	206	Telemart	90-93
102	DTK Computers	196	225	MicroWarehouse Inc.	190-193	306	Tenex Computer Express	444
186	Dataease International	396	*	Micrografix	113	353	Texas Instruments	332
281	Datasouth Computer Corp.	282	*	Microsoft	1	311	The Computer Book Club	415-417
*	Dataworld	221	*	Microsoft	C2-C4	379	Toshiba of America	125-127
536	Dell Computer Corporation	C5-C8	*	Microsoft	18-19	121	Tri-Star Computer	17
472	Dell Computer Corporation	199-201	*	Microsoft	148-149	177	Ultra Comp.	40-41
474	Dell Computer Corporation	202-203	*	Microsoft	302-303	367	Universal Data Systems	422
532	Dell Computer Corporation	204-205	*	Microway	245	270	Western Telematic	291
*	Dell Computer Corporation	483-484	489	Midwest Computer Works	436	*	Wordperfect	52-53
250	Delrina Technology	76	108	Multi Tech Systems	292	255	Wordstar International	252
*	Digital Equipment Corporation	84-85	283	Nanao, USA Corp.	168	732	Zenith Data Systems	5
239	Digital Research Inc.	116-117	242	NCR Corporation	222-223	115	Zeos International	29
*	Dow Jones Information Services	147	526	NCR Corporation	268-269	488	Zeos International	30-31
347	Dustin Discount Software	14	153	NEC Technologies, Inc.	24-25	722	Zeos International	78-79
332	Dynamic Microprocessor Assoc.	74	217	NEC Technologies, Inc.	368	*	Zeos International	129-136
362	Eastman Kodak	331	531	Nissei Sangyo America, Ltd.	20	723	Zeos International	137
118	EMS Systems International	446	*	Northgate Computer Systems	346-350	*	Zeos International	209-216
366	Enable Software Inc.	219	*	Northgate Computer Systems	352-353	721	Zeos International	250-251
479	Ergo Computing Inc.	228-229				388	Zeos International	310-311

* No Reader Service #.

After Hours

Dynamix

CONTINUED

detective work (hear the *Blade Runner* echo, there?). When MTZ does a job on the mayor's daughter, you are called in to take the case—unofficially, of course.

LOADS OF WAYS TO PERISH

There are many ways that success can elude you in *Rise*. You can fail to solve the mystery of the daughter's death, and allow Bahumat and his minions to dump MTZ into the Hollywood Reservoir. But that's just the beginning. You can sleep through crucial events, or get killed by a fall from a roof, by rats in a sewer, or by electric shock (remember, it's not the volts, it's the amperage) and those are the just the *pleasant* ways to go.

These perils and their numerous associated interactive possibilities represent the best part of the game. Missed your date with Karen, your girlfriend who works for City Hall? She may refuse to help you with critical clues. Cheat on her and you might as well pre-order your body bag. Say the wrong thing to your sleazy informants and they'll clam up tighter than, well, *clams*. Take a bit too long to case a suspect's apartment, and you'll be arrested and spend the night in jail. Say the wrong thing to the mayor and

he'll throw you in jail. If you try to rescue Karen from Bahumat's clutches, you risk missing your crucial battle with the Big Guy himself. Then it's bye-bye L.A.

DECISIONS, DECISIONS

None of these hazards alone will be enough to make you lose the game; you can get along without Karen or the mayor's help. You might also get along without the various items given to you by Li Chang, a helpful-but-inscrutable Chinese scholar and back-alley denizen.

Indeed, because of the game's multithreaded nature, you'll have to make oodles of hard decisions during the four days you've been given to stop the terror. The beauty of the challenge is that, just as there are many ways to lose, there is also more than one way to win. You can get by with a series of bribes, entreaties, threats, and even the occasional well-placed high explosive. But you won't make it if you don't use your wits to decode clues and carefully time your moves. All that complexity virtually guarantees that even the most jaded, experienced gamer will want to play *Dragon* more than once.

To provide a welcome break from the general strategizing, Dynamix has included two arcade sequences, which are quite difficult in and of themselves. Because the inexperienced player can easily be killed during an arcade sequence, the software automatically prompts you

to save your game when you begin one of them.

MEMORY HUNGRY, BUT SOUNDS GOOD

This is not a game for casual users; you'll need to unload every TSR on your system just to fit *Dragon* into memory; the game requires at least 560K RAM.

Dragon is easily controlled by mouse, keyboard, or joystick, although the mouse appears to be the fastest and easiest choice. Dynamix's pop-up "VCR" panel lets you save individual games and set a number of game parameters, including graphics resolutions, game difficulty, and sound and music settings, at any point during play.

And speaking of music, the sound track will make you forget whatever you paid for your AdLib, Sound Blaster, or other sound card. The music, composed specifically for *Dragon*,

adds measurably to the game's tangible realism. Obviously, you won't get nearly the same effect if you rely on your PC's little speaker.

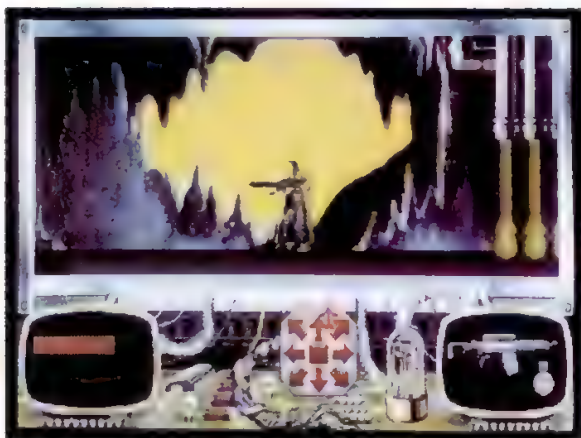
The combination of a complex, challenging scenario, excellent graphics, and high-quality sound make *Rise of the Dragon* worth any veteran gamer's time and energy, and will make this game a good introduction for newcomers to fantasy land. Dynamix's *Rise of the Dragon* is unusual for its superb execution, even if not so unusual for its storyline—this time, it's a case in which familiarity breeds delight.

List Price: *Rise of the Dragon*, \$79.95. **Requires:** 560K RAM; CGA, EGA, or MCGA 256-color graphics; DOS 2.10 or later. Dynamix Inc. P.O. Box 11806, Eugene, OR 97440-9988; 503-343-0772.

CIRCLE 414 ON READER SERVICE CARD



In *Rise of the Dragon*, abusing the deadly drug MTZ can literally be murder on your looks.



In 256 lurid colors and great detail, *Rise of the Dragon* depicts the nightmarish L.A. of the 21st century.

Play It By Ear: More Patient Than Any Music Teacher



While interval training may be the latest rage among runners, Ibis Software offers another sort of interval training (as well as scale, melody, and single-note training) for the more musically inclined.

The company's \$99.95 *Play*

It By Ear software will drill you with a multitude of well-designed ear training exercises. And it does so more patiently than the most soft-hearted of music teachers.

Ear's exercises fall into two categories: identification and composition. In the identification exercises you answer mul-

CONTINUES

After Hours

Ibis Software

CONTINUED

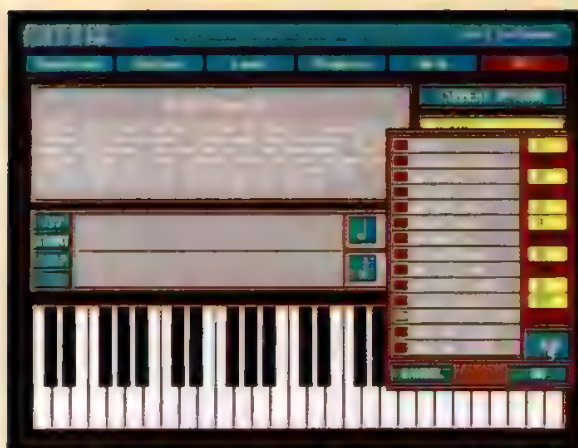
multiple-choice questions identifying scales, intervals, or single notes. For the composition exercises you mimic the note, melody, scale, or interval that the program plays.

Ear requires no special hardware, although it supports most of the popular sound cards, as well as MIDI-controller input. You can choose either a keyboard or guitar-fret-based interface. To answer an exercise using the keyboard interface, for instance, you click the mouse on the proper key on the on-screen keyboard, or hit the corresponding key on your MIDI keyboard. One caveat: If your MIDI controller transmits on a different channel than your MIDI adapter, you won't get any audio feedback, because *Play It By Ear* doesn't rechannel.

When you make an error, the program displays a crumpled note above or below a line, representing whether you were too high or too low in pitch. Upon request, *Ear* will replay the exercise or show you the correct sequence of notes.

The exercises can be extensively customized. You can mix and match among several options, including six different skill levels; any combination of notes or seven different predefined scales or modes (such as phrygian or mixolydian); and the lowest, highest, and root note of the exercise range. *Ear* tracks your progress, and generates a bar chart indicating your progress for all sessions.

The program is quite cleverly implemented, but its progress gauge could use a little work. Progress is based on a combination of accuracy and speed of response, but it's very easy to slip and hit the wrong notes when using a mouse, a source of much frustration. On the whole, how-



Play It By Ear allows you to invent your own scales by simply choosing the notes you'd like to include.

ever, it's a solid piece of software that nonmusicians and musicians alike can benefit from. If you weren't born with perfect pitch, you'll never have it—but *Play It By Ear* can help you get as close as disciplined practice will take you.

List Price: \$99.95. **Requires:** 640K RAM, mouse, DOS 2.0 or later. Sound card recommended. Ibis Software, 90 New Montgomery St., #820, San Francisco, CA 94105; 415-546-1917.

CIRCLE 415 ON READER SERVICE CARD

MOVING?

Please write to: PC Magazine, P.O. Box 54093, Boulder, CO 80322. Include your mailing label from a recent issue of PC Magazine for faster service. Please allow up to 60 days for change of address to take place.

by
Bill Howard

Abort, Retry, Fail?

The Lighter Side of Personal Computing



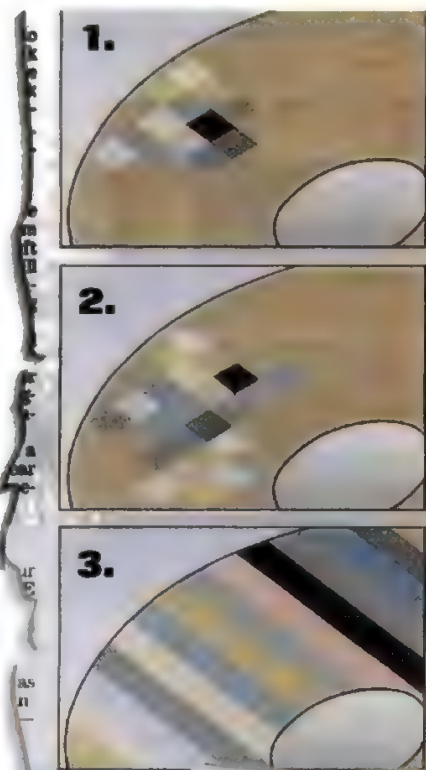
Courier HST

External
14,400 bps Modem
MNP Level 1-5
Error Correction
Data Suppression

Courier V.32HST

14,400 bps
Dual Standard Modem
MNP Level 1-5 Error
Correction
Data Suppression

Modems like that, we've got already: the January 1990 catalog for Technology Marketing Group, Minneapolis, Minnesota, offers U.S. Robotics modems with data suppression.

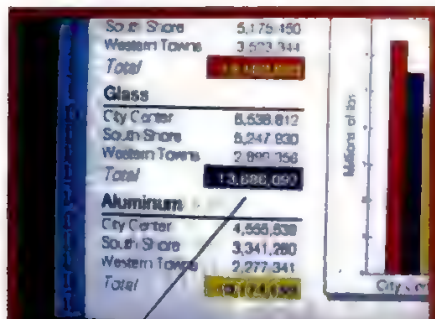


Disk optimization, before and after, as explained in the November 1990 Tiger Software catalog. Optimized or not, tracks run in concentric rings around the disk, not as parallel lines across the disk.

New Math

"One way to add more memory to your system is to install *extended memory*. Extended memory is general-purpose memory beyond 640K on 80286, 80386, and 80486 computers. In effect, it is a simple extension of your computer's conventional memory. (Many 80286 and 80386 computers come with 640K of conventional memory and 256K of extended memory, for a total of 1MB of memory.)"

Microsoft Windows 3.0 user's guide, Page 495



"Think Graphically. Think Analytically. Think Confidently," this Lotus 1-2-3 Release 3.1 ad proclaims. Now think how silly Lotus looks because the numbers don't add up right. The correct totals for Q2 Revenue, Glass, and Aluminum should all be 1 greater than shown. And while we're at it (see the inset, lower right), who ever heard of putting a positive number in red ink?

Combine a variety of colors, type styles

is increased over the year. Prices for aluminum are... for the company. Prices for aluminum are... more glass, markets for the raw material are

	Q1	Q2	Q3
1,890,785	1,862,024	2,378,397	
1,700,504	1,862,135	1,869,430	
1,146,884	1,182,022	1,489,421	
			10,757,246

Q4	✓	1989
2,415,407		6,886,910
1,987,897		5,573,021
1,331,601		3,789,661
1,004,905		16,249,600

If your entry is used in Abort, Retry, Fail? we'll send you \$50 and a PC Magazine T-shirt. Caution: In case of multiple entries, the postmark date, neatness and completeness of entry are considered. Winners this issue: Jay Taylor (data suppression), Gerald Lerman (Lotus 1-2-3), David Finch (optimized disk), Barra C. Helard (extended memory).

DROP US A LINE. AND WE'LL SEND YOU OURS.

Here's the deal. Just fill-out and send us this postage-free card and we'll send you the new Dell product catalog.

of PCs, laptops, and servers. Including our hot new 386™ and notebook PCs. You'll also find out about our award-winning service and unbelievably low prices.

TO ORDER, CALL
800-873-1130
FOR FASTER PROCESSING PLEASE REFERENCE #11BE7
HOURS: 7 AM-9 PM CT M-F 8 AM-4 PM CT SAT.
IN CANADA, CALL 800-387-5752.

It will tell
you all about
our newest line



So return this card today, or call us at
(800) 873-1130. In Canada, call
(800) 387-5752.

☐ Please have a Dell Representative call me.

Name: (M) _____
Title: _____
Company: _____
Address: _____
City: _____ State: _____ Zip: _____
Type of Business: _____
Approx. # of Employees in Company: _____
Home Phone: () _____
Business Phone: () _____
Fax #: () _____

1. Which products are you most interested in?
- | | |
|--|--|
| ☐ 286-based systems | ☐ UNIX*-based systems |
| ☐ 386-based systems | ☐ Laptops/Notebooks |
| ☐ 386SX-based systems | ☐ Other: _____ |
| ☐ i486™-based systems | |

2. Are you interested in computer products for:
- ☐ Home ☐ Business ☐ Resale

3. If for resale, please identify your primary customer:
- ☐ Government ☐ Education ☐ General Business ☐ Medical

4. How many PCs does your company plan to purchase in the next twelve months?
- | Quantity | Timeframe | Quantity | Timeframe |
|----------|-------------------|----------|---------------------|
| _____ | Less than 1 month | _____ | 6-12 months |
| _____ | 1-3 months | _____ | More than 12 months |
| _____ | 3-6 months | | |

5. What do you plan to use computer products for?
- _____
- _____
- _____

6. How many PCs do you have installed now at your company?
- _____

7. Are you interested in leasing? ☐ Yes ☐ No

AD CODE 51BE7

☐ Please have a Dell Representative call me.

Name: (M) _____
Title: _____
Company: _____
Address: _____
City: _____ State: _____ Zip: _____
Type of Business: _____
Approx. # of Employees in Company: _____
Home Phone: () _____
Business Phone: () _____
Fax #: () _____

1. Which products are you most interested in?
- | | |
|--|--|
| ☐ 286-based systems | ☐ UNIX*-based systems |
| ☐ 386-based systems | ☐ Laptops/Notebooks |
| ☐ 386SX-based systems | ☐ Other: _____ |
| ☐ i486™-based systems | |

2. Are you interested in computer products for:
- ☐ Home ☐ Business ☐ Resale

3. If for resale, please identify your primary customer:
- ☐ Government ☐ Education ☐ General Business ☐ Medical

4. How many PCs does your company plan to purchase in the next twelve months?
- | Quantity | Timeframe | Quantity | Timeframe |
|----------|-------------------|----------|---------------------|
| _____ | Less than 1 month | _____ | 6-12 months |
| _____ | 1-3 months | _____ | More than 12 months |
| _____ | 3-6 months | | |

5. What do you plan to use computer products for?
- _____
- _____
- _____

6. How many PCs do you have installed now at your company?
- _____

7. Are you interested in leasing? ☐ Yes ☐ No

AD CODE 51BE7

ORDER OUR FREE CATALOG NOW OR PAY THOUSANDS LATER.

For A Free Catalog Of
Dell's New Computers, Send This Card.



386 and 486 are trademarks of Intel Corporation. UNIX is a registered trademark of AT&T in the United States and other countries. ©1991 Dell Computer Corporation. All rights reserved.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

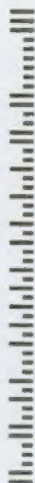


BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 6745 AUSTIN, TEXAS

POSTAGE WILL BE PAID BY ADDRESSEE

DELL COMPUTER CORPORATION
DEPT DH
9505 ARBORETUM BLVD
AUSTIN TX 78759-9860



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

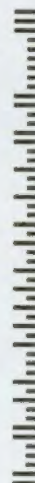


BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 6745 AUSTIN, TEXAS

POSTAGE WILL BE PAID BY ADDRESSEE

DELL COMPUTER CORPORATION
DEPT DH
9505 ARBORETUM BLVD
AUSTIN TX 78759-9860



Can you afford not to buy the Dell® 320N?

At a time when everybody is cutting budgets, can anyone afford to spend up to an extra \$2,950?

More importantly, can you afford to go on the road counting on service from a Compaq dealer you've never heard of?

Especially when every Dell system comes with a full gamut of road services. Like a toll-free technical support line that helps users solve 90% of their problems over the phone.

And if you need help in the middle of the night, just call Dell's innovative TechFax line. It automatically faxes back detailed information on your Dell computer. Even to your hotel.

If that doesn't solve it, call for road service. A trained technician will come to your hotel room, or office,[△] the next business day with a replacement system if necessary. And if possible, your hard drive contents will be transferred on the spot.

THE NEW DELL SYSTEM 320N 386SX 20 MHz AND THE NEW DELL SYSTEM 212N 286 12 MHz.

- Intel® 80386SX microprocessor running at 20 MHz (320N) and the Intel 80C286 microprocessor running at 12 MHz (212N).
- Standard 1 MB of RAM* expandable to 5 MB (on the system board using 1 MB or 2 MB memory modules).
- 640 x 480 VGA LCD with edge-light.
- One expansion slot for Dell Data/FAX modem.
- 6.4 lbs. with battery; dimensions are 8.5" D x 11" W x 2" H.
- 1.5" 1.44 MB diskette drive.
- 85-key keyboard with embedded numeric keyboard.
- 1 serial port and external VGA monitor port.
- Selectable parallel printer or external 5.25" disk drive/tape backup port.
- Connector for numeric keypad or 101-key keyboard.
- Mouse port.
- Removable and rechargeable battery pack utilizing Dell's "Continuous Power Battery System" (patent pending).

212N: 20 MB, 1 MB RAM* \$2,199
40 MB available for the 212N.



320N: 30 MB, 1 MB RAM* \$3,199
60 MB available for the 320N.

All at no additional cost for the first year you own your computer.

It's light weight. But it's no lightweight.

Dell's notebook weighs just 6.4 pounds (1.1 pounds lighter than the Compaq LTE 386s/20). It measures a trim 8½" x 11" x 2". But technically, this is heavy artillery.

The Dell 320N features a built-in 3.5" diskette drive with your choice of high-speed 30 or 60 MB hard drives.

The display is a high quality VGA LCD. There's an optional, built-in Data/FAX modem. And a sliding door that lets you easily insert a math coprocessor, RAM modules or the

modem without major surgery. (Dell also has the 212N, with a 12 MHz 286 and 20 or 40 MB hard drive.)

Even the keyboard shows touches of brilliance. It's a complete 85-key layout. Including the special screen navigation keys (Home, End, Page Up, Page Down and separate Cursor keys) that let you easily navigate even the most spread-out spreadsheet. And every key is engineered for extended travel, to provide the familiar touch of a top-of-the-line desktop system.

Don't worry. Be happy.

One more thing to consider. When you buy from Dell, you're dealing directly with a company that has won PC Week's Corporate Satisfaction Poll for PCs, servers and laptops. Not just once. An unprecedented eight times.

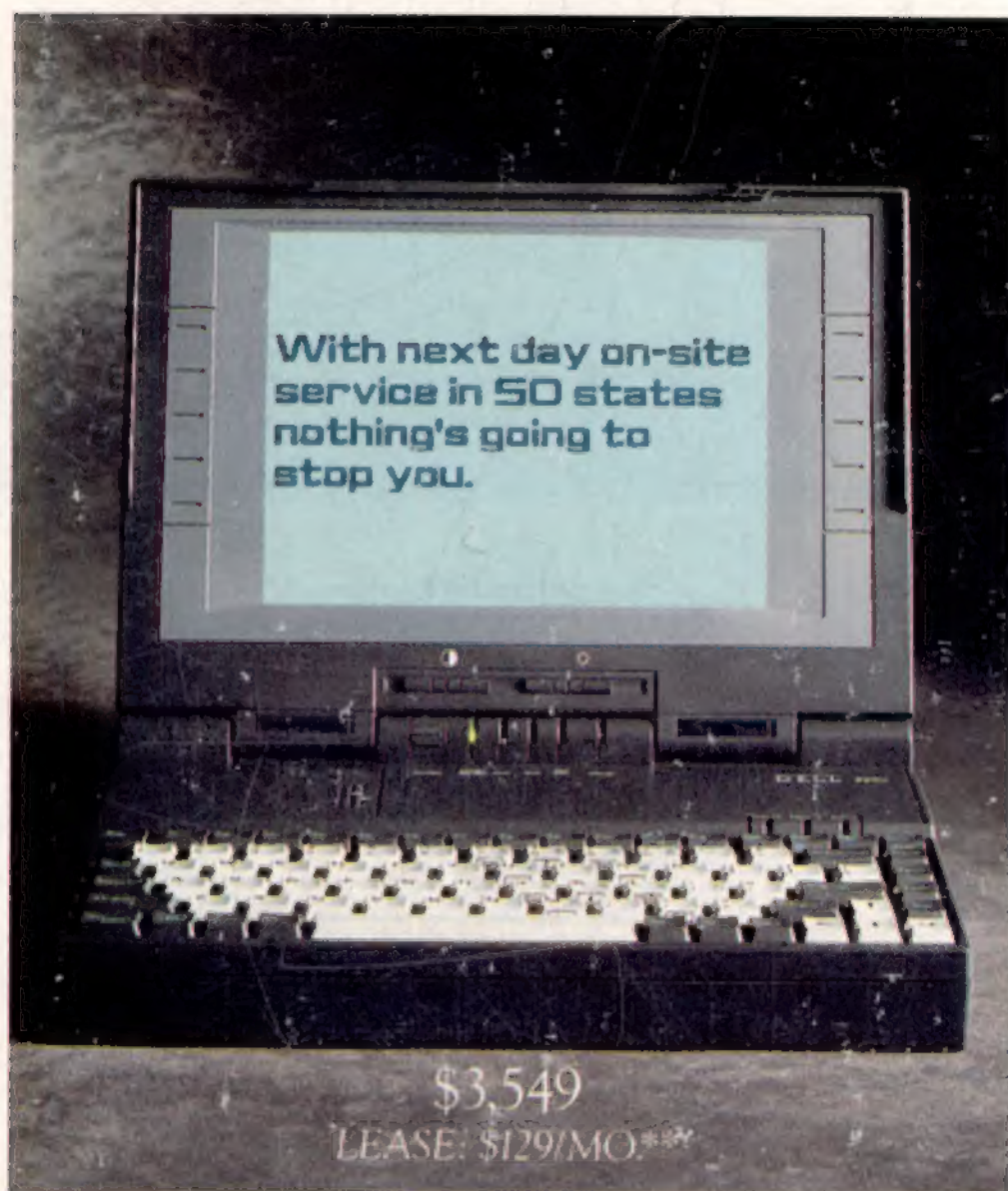
A company that will custom configure any system to meet your needs. And then work with you to custom configure a finance or leasing plan.[°]

And we back it all with a 30-day no questions asked satisfaction guarantee.

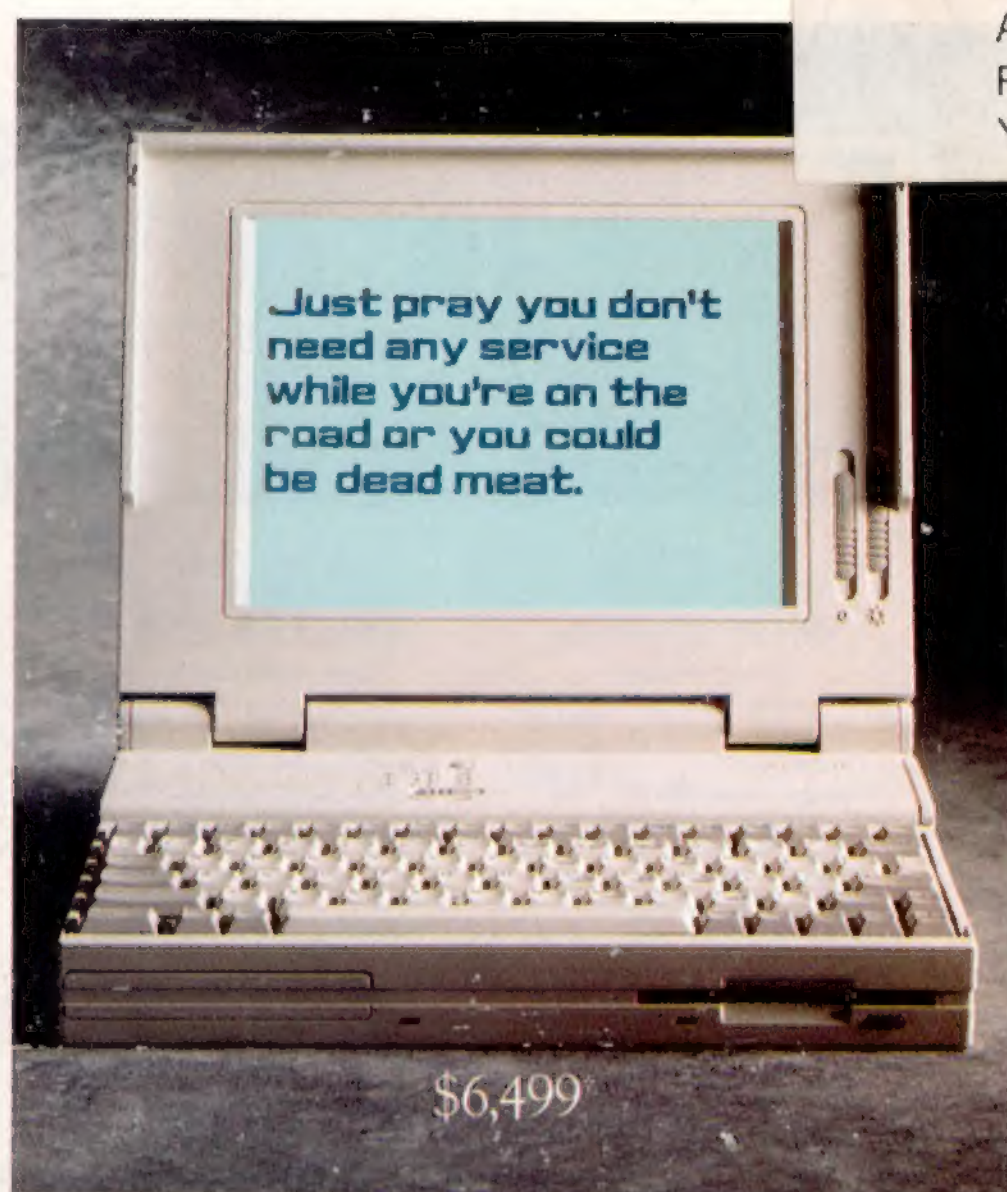
Call today for either of our new notebook computers. And hit the road, equipped with a Dell.

That'll really give the guys with the Compaqs something to worry about.

TO ORDER, CALL	DELL COMPUTER CORPORATION
800-879-9500	
FOR FASTER PROCESSING PLEASE REFERENCE #1185 HOURS: 7 AM-9 PM CT M-F 8 AM-4 PM CT SAT	
IN CANADA, CALL 800-387-5752	

ROAD WARRIOR.

DELL SYSTEM® 320N 386™ SX 20 MHz
SYSTEM INCLUDES VGA LCD MONITOR, 30 MB HARD DRIVE, 2 MB RAM.

ROAD WORRII

COMPAQ LTE 386s/20 386SX 20 MHz
SYSTEM INCLUDES VGA LCD MONITOR, 30 MB HARD DRIVE, 2 MB RAM.
ACTUAL DEALER PRICES MAY VARY.

There you are, doing battle far from home. Armed with your powerful new notebook computer. As you prep for the next day's conquest, something unexpected happens.

Suddenly you find yourself stranded in some strange hotel room, with your computer down. And no one will come service it.

You wake up in a pool of sweat.

Dreams like this make it very easy to choose Dell's 20 MHz 386SX notebook computer over the remarkably overpriced and underserviced Compaq LTE 386s/20.

Because when you buy the Compaq system, this isn't just a bad dream. It's a real possibility.

For more details, look inside.

TO ORDER, CALL

800-879-9500

FOR FASTER PROCESSING PLEASE REFERENCE #11BE5
HOURS: 7 AM-9 PM CT M-F 8 AM-4 PM CT SAT

IN CANADA, CALL 800-387-5752

DELL
COMPUTER
CORPORATION